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# REPORT

OF THE

## — COMMITTEE TO INVESTIGATE THE COST OF AN ARMOR PLANT FOR THE UNITED STATES

PURSUANT TO

A PROVISION OF AN ACT MAKING APPROPRIATIONS  
FOR THE NAVAL SERVICE FOR THE FISCAL  
YEAR ENDING JUNE 30, 1915



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COMMITTEE TO INVESTIGATE THE COST OF AN ARMOR PLANT FOR  
THE UNITED STATES.

Hon. BENJAMIN R. TILLMAN, United States Senate, *Chairman*.

Hon. LEMUEL P. PADGETT, Member of Congress.

Rear Admiral JOSEPH STRAUSS, United States Navy.

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## ARMOR PLANT FOR THE UNITED STATES.

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WASHINGTON, D. C., *February 24, 1915.*

The committee appointed under the provisions of the act making appropriations for the Naval Service for the fiscal year ending June 30, 1915, and for other purposes, approved June 30, 1914, begs to submit to Congress the following report, to wit:

The law under which the committee acts is as follows:

A committee is hereby appointed, to consist of the chairman of the Committee on Naval Affairs of the Senate and the chairman of the Committee on Naval Affairs of the House of Representatives and one naval officer to be selected by the Secretary of the Navy, to investigate and report at the next regular session of Congress upon the cost of erection of an armor plant to enable the United States to manufacture its own armor plate and special treatment steel, capable of standing all ballistic and other necessary tests required for use in vessels of the Navy, at the lowest possible cost to the Government, taking into consideration all of the elements necessary for the economical and successful operation of such a plant. Said report shall contain the estimated cost of a plant and site sufficient to accommodate a plant having an annual output capacity of twenty thousand tons, and also a plant having an output of ten thousand tons, and also an itemized statement of the estimated cost of the necessary buildings, machinery, and accessories for each, and the estimated annual cost and maintenance of each, and the estimated cost of the finished product.

Said committee is authorized to sit during the recess of Congress, to send for persons and papers, and to administer oaths.

The sum of \$5,000 is hereby appropriated, out of any money in the Treasury not otherwise appropriated, to pay the expenses of said committee, payable upon vouchers signed by the chairman of said committee.

The committee subdivides its report into two parts, with two appendices, as follows:

PART I.—Containing the estimates of cost of an armor plant and site sufficient to accommodate an armor plant having an annual output capacity of 20,000 tons, and also a plant having an output of 10,000 tons per year, with itemized statement of estimated cost of the necessary buildings, machinery, and accessories for each.

PART II.—Estimated cost of production of face-hardened armor made in the 20,000-ton plant when working at full capacity, and the estimated annual cost and maintenance of this plant; also the estimated cost of production of face-hardened armor made in the 10,000-ton plant when working at full capacity, and the estimated annual cost and maintenance of this plant.

APPENDIX A.—Containing the hearings of the committee.

APPENDIX B.—Containing the minutes of the committee.



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# PART I

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## PART I.

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In making the estimate of cost of an armor plant having a 20,000-ton capacity and of an armor plant having a 10,000-ton capacity all available sources of information have been consulted, namely, the Bureau of Yards and Docks; many manufacturers of machine tools, cranes, gas producers, and cars; naval inspectors of ordnance stationed at the works of the various armor makers; engineers employed by steel makers; the files of the Navy Department, and previous congressional reports and investigations.

It is not considered that these estimates are sufficiently accurate to enable the erection of such a plant to be proceeded with. It is thought that they are made with as great accuracy as was possible under the circumstances, and sufficiently so to enable Congress to make the first appropriation, should it be the will of Congress so to do, after its examination of this report.

In these estimates the production of the special-treatment steel plating for the tops of turrets and conning towers, as would be necessary to keep pace with the production of thick armor, has been considered, but the manufacture of all special-treatment steel required by the Navy each year on a similar basis has not been considered, for the reason that the committee finds that a plant for the production of special-treatment steel for protective deck plates and similar purposes will have an annual capacity 10 times as great as will be required. It is not possible to construct a rolling mill capable of rolling the size and quality of plate desired with a less annual output. If such a plant were erected, its entire organization and machinery would be idle for 47 weeks in the year.

Owing to the lack of the necessary engineering and designing skill, it has not been possible to lay down this plant accurately, and to place in the various buildings the various pieces of machinery in exactly the same way that they would be installed, and therefore it is probable that many items would have to be added in the shape of machinery, tools, and general equipment which it is impossible to anticipate.

Ten per cent has been added to the estimates for constructive work, buildings, and machinery, in order that any unforeseen contingencies would be covered; but even then, before proceeding with the erection of a plant a well-known consulting engineer, familiar with this class of work, and with the laying out of a factory, should be consulted, and carefully drawn plans and designs of all buildings and necessary machinery should be made before the construction could be proceeded with. There are certain features in regard to the plan and detailed arrangements of such a plant which only engineers and metallurgists of high repute could pass upon.

Estimates were first prepared for the 20,000-ton plant, and the 10,000-ton plant estimate has been patterned therefrom. The price

of the land necessary for the plant, and certain other items are so indefinite as to be only the roughest approximation. The location and local conditions will bear largely on the cost of the various buildings and the installation of the machinery therein. The committee calls attention to the fact that the Government now owns, at the Philadelphia Navy Yard, ample land for the erection of an armor factory and therefore no land would have to be bought. Philadelphia is an ideal place for the erection of such a plant, as it is accessible both by deep-water transportation and railroad facilities, is near coal and iron, and has a fine labor market. However, the Navy Department itself will select the location and construct the plant if Congress orders one, and the committee only mentions that no expense for land will be necessary. Besides, the navy yard has facilities for assisting in the construction of this plant, which will largely reduce the expense of erecting it.

The capacity of the 20,000-ton plant has been based upon completing 20,000 tons of armor; that is to say, the armor for two battleships and the necessary ballistic, experimental, and shell-test plates usually required during the course of a year.

No estimate for the manufacture of any special treatment steel is made, except that required for the turret and conning tower tops, as has been explained previously.

For the production of 20,000 tons of finished armor plate per year about 70,000 tons of ingots would have to be cast, and as the open-hearth plant would be shut down on Sundays and holidays there could be no casting on Saturdays, owing to the fact that no stripping would be permissible on Sundays, and the plant would be able to average only 250 days per year, which means that 280 tons of armor ingots would have to be cast each day.

Each open-hearth furnace would be out for repairs 8 weeks per year, or the 5 would have a total of 40 weeks of idleness. Thus we can reckon on an output of about 85 per cent of the total capacity of five furnaces.

Considering the average weight of plate and the number of plates installed on each of the newest design of battleships, if this plant is to produce the armor for two battleships there will have to be presented for forging, cementing, reforging, treatment, hardening, and bending two plates per day and there must be completed in the machine shop an average of five plates every three days.

#### OFFICE BUILDING.

The office building contemplated will be a two-story brick building, fitted for offices on the lower floor, with a drafting room, blueprint room, and photographic room, with vaults for tracings and files, on the second floor. In this office would be the administrative and designing force of the plant. The equipment of the office building would consist of desks, chairs, stationery, typewriters, adding machines, etc., necessary and proper for a completely equipped office building ready to commence work in a plant of this size. The estimate given for the equipment of this office building is necessarily very indefinite and has been made large in order to cover everything, including equipment for foremen's and leading men's offices in the various buildings.



## PHYSICAL AND CHEMICAL LABORATORY.

This building will be a two-story brick building, fitted for physical laboratory on the lower floor, with chemical laboratory on the upper floor. The equipment will consist of the necessary instruments and material for the conduct of the work at an armor plant of this size, including a complete microphotographic and examination equipment.

## TOOL HOUSE.

This will be a one-story structural steel building, with corrugated-steel covering, for the purpose of housing wheelbarrows, shovels, picks, crowbars, and other tools used in the yard.

## BRICK SHED.

This will be an open shed with a raised concrete platform; the frame to be of structural steel, the roof to be of galvanized steel. On the platform, under cover, will be stored refractory brick, large quantities of which will have to be kept in stock for the repairs of open-hearth and treatment furnaces.

## CARPENTER SHOP.

This building will have a pitched roof, concrete floor, with steel floor beams; will be fireproofed; will be heated, lighted, and equipped with the necessary plumbing. It will have two stories, and the equipment will consist of workbenches, vises, wood lathes, planers, wood saws, joiners, band saws, molding machine, rip and crosscut saws, and sanding machine, with shafting, belting, and pulleys for driving the above.

## BLACKSMITH SHOP.

This building will be one story high with an earth floor; pitched roof of galvanized steel. The equipment will consist of forges, anvils, and one automatic steam hammer, the idea of this shop being to dress the tools used in the machine shop and around the armor plant and to make minor repairs.

## STOREHOUSE.

This building will be a two-story brick building with a pitched roof of galvanized steel; will have a concrete floor, steel floor beams; will be fireproofed; and its equipment will consist of shelves, counters, desks, and necessary arrangements for keeping complete account of all stock.

## LOCOMOTIVE HOUSE.

This building will be sufficiently large for housing locomotives and steam cranes, and will be fitted for making the necessary repairs to this rolling stock.

## ELECTRIC POWER PLANT.

This plant will be contained in a brick building with structural steel frame and galvanized-iron roof and will have the necessary turbo-generators, piping, auxiliaries, switchboard, air compressors, etc.

## BOILER PLANT.

The boiler house will be a brick building with galvanized-steel roof, and will contain 20 boilers, with automatic stokers and necessary stacks. Over the boilers will be fitted reinforced concrete coal bunkers and underground will be the necessary ash-handling machinery.

## OPEN-HEARTH PLANT.

In the open-hearth plant will be made all of the steel from which the armor is to be fabricated. The raw material used will be pig iron and scrap, with the necessary nickel, ferrochrome, ferromanganese, etc., required. The building will be one story, with a monitor in its center, the frame of the building to be of structural steel, which will be covered with galvanized steel. It will be fitted with crane runways, and will be constructed on such levels as to best accommodate the 5 open-hearth furnaces and the 10 accompanying gas producers. The charging floor in front of the open-hearth furnaces will be laid with tracks for two electric charging machines and for the necessary charging bogies. In the rear of the furnaces, at a lower level, will be two casting pits in which the ingots will be cast. Estimates have been made for a heavy crane capable of handling the largest ingots and ladles used in connection with pouring the ingots.

No estimate has been made for the making of sand molds, as it is contemplated that only metal molds will be used, and they will be purchased from some manufacturer of high-grade castings, rather than manufactured in the plant. Estimates have been made for the necessary gas mains and coal and ash handling machinery in connection with the gas producers, these producers to be located in a lean-to attached to the building.

## FORGING AND BENDING SHOP.

The building will be a flat roof with monitor, fitted with the necessary crane runways. In this building will be located three 14,000-ton capacity presses capable of forging and bending the thickest and heaviest armor known or required.

In the armor plants of domestic manufacturers the forging and bending presses have heretofore been of the hydraulic type, the use of which type necessitates a very high-powered pumping engine. After consultation with the manufacturers of the steam intensifier type of forging press, the committee is informed by them that it is entirely practicable to use this type of press for the forging and bending of armor, and they state that such presses are used abroad, but none of them have been used in this country, and if it is found that they can be used satisfactorily they will be cheaper than the hydraulic press. This estimate contemplates the use of the steam intensifier type of press. Should the Government decide to build an armor plant, this matter should be one for the most careful investigation by the engineers employed for the design and layout of the plant, and should it be decided that it would be safer to follow the design of presses used in existing armor plants in this country, these estimates would have to be increased by about \$750,000 for the 20,000-ton plant and \$500,000 for the 10,000-ton plant.



This shop will also contain ingot-heating and car-bottom plate-heating furnaces for the heating of ingots and plates preparatory to forging, re-forging, and bending. The gas producers required for these furnaces will be located in a lean-to on the cementing and tempering shop.

A very large number of dies and tools are required in this shop, which could not be given in the form of an itemized list in the estimate, but are lumped into one general item.

#### CEMENTING AND TEMPERING SHOP.

This shop will be a one-story, flat-roof, and monitor building, structural-steel frame covered with galvanized steel, in which the armor plate will be carbonized and heat treated, and finally water hardened. It will contain a large number of car-bottom plate-heating furnaces and water-hardening sprays, piping, and reservoirs, required for tempering. In a lean-to will be located the necessary gas producers for this shop and for the forging and bending shop. Estimates are made for the gas mains and coal and ash handling machinery for the gas producers. The location of the pumps to supply hydraulic pressure throughout the plant is contemplated as being in this building. This hydraulic pressure will be required for the withdrawal of car bottoms from furnaces, for the opening of the various furnace doors, operation of valves, etc.

#### MACHINE SHOP.

The machine shop will be a brick building, one story, flat roof, with the necessary crane runways. This building will be built in two spans and will be heated and well lighted, in order that machine-tool work may be done in comfort at all times. The shop will contain the machine tools for finishing armor plate, and will be supplied with cranes for its handling. There will also be the necessary surface plates for the erection of the armor before it leaves the shop. The estimate for this equipment was more accurately and readily prepared than for any other part of the plant, as the makers of the tools were consulted and actual estimates obtained.



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## PART II

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## PART II.

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The estimated cost of face-hardened armor made in the 20,000-ton and the 10,000-ton plants, when working at full capacity, is made up as follows:

(a) An estimate has been made of the probable number of employees required for plants of these sizes, with their daily or annual rates of pay. The national holidays, summer half holidays, and 15 days' annual leave, due to each Government employee, have been considered. With this in view the total annual pay roll has been computed, which has been divided between 20,000 tons and 10,000 tons of armor, which are to be the respective productions of the plants, giving the cost of labor per ton of armor in such plants. In this cost of labor per ton of armor is included the labor of repair and maintenance, as the men who perform this work are included in the annual pay roll of the plants.

(b) The rates of pay have been obtained by ascertaining what men of similar rating receive at similar plants and by consulting the wage schedule of the navy yard, Washington.

(c) The metal per ton of plate has been obtained by taking the standard practice for making up a charge of nickel-chrome alloy and charging the price per ton which prevailed during 1913 for the material. The cost of metal per ton is the same for both plants. The furnace losses, pit scrap, rejected ingots, have been obtained from actual practice. The amount of finished plate produced from ingots at the forge has been obtained by actually ascertaining the respective weights of ingots at forge presented by one company and comparing it to the number of finished plates produced by that same company. In obtaining the cost of the metal in a ton of plate credit for pit scrap and nickel scrap plates and ingots has been given at the same rate at which this material is charged into the furnace charge, the labor necessary for cutting this material up being already included in the pay roll.

(d) The maintenance and repairs per ton of armor has been obtained by estimate and is thought to be fairly accurate. The price of the coal used is the contract price for coal for the Navy for 1915. The other estimates have been obtained by observation and investigation. The 2 per cent of installation cost for upkeep of plant and buildings is for the extensive overhauls of furnaces and upkeep of the buildings and materials necessary to keep the plant in first-class condition, other than those small repairs which are necessary to keep in a going condition. This percentage is less than has ever been used in previous estimates, but is thought to be sufficient.

(e) By adding the four parts mentioned previously the total cost per ton of armor has been obtained, which is the production cost only. No allowance is made for depreciation, fire losses, or Navy Department administration.

The following estimates for armor made in the 20,000-ton and the 10,000-ton plants, respectively, are made on the assumption that the Government will require sufficient armor each year to keep these plants going at their full capacities. Should these plants not be kept going at full annual capacity, the cost of the armor produced would be increased, and should there not be in any one year occasion for the manufacture of any armor the cost of maintenance for this year would have to be distributed over the production cost for several years, thus increasing the average cost of the armor produced in the plants.

Just how much this increase in cost of armor would be, due to the fact that the plant is not working at full capacity, can not be foretold, but it would vary, due to the specific circumstances under which the plant might be operated for that year.

Summary of probable cost of armor in a 20,000-ton Government armor plant when operating at full capacity.

	Component.	Amount per ton.
Exhibit A.....	Labor per ton (pay roll).....	\$71.92
Exhibit B.....	Metal per ton.....	107.14
Exhibit C.....	Repairs and maintenance (a).....	49.72
	Maintenance of plant (b).....	10.33
	Total.....	230.11

Summary of probable cost of armor in a 10,000-ton Government armor plant when operating at full capacity.

	Component.	Amount per ton.
Exhibit A.....	Labor per ton (pay roll).....	\$87.38
Exhibit B.....	Metal per ton.....	107.14
Exhibit C.....	Repairs and maintenance (a).....	55.00
	Maintenance of plant (b).....	13.27
	Total.....	262.79

EXHIBIT A.

Pay roll summary of 20,000-ton armor plant.

Em- ploy- ees.	Location.	Daily.	Annual.
8	General offices.....		\$47,500.00
27	Main office.....	\$84.88	
10	Pay and time office.....	37.60	
10	Laboratory.....	31.76	
3	Dispensary.....	7.20	
16	Blacksmith shop.....	58.00	
24	Carpenter shop.....	90.32	
80	Power plant.....	229.80	
46	Locomotive house.....	125.84	
13	Storehouse.....	36.88	
105	Miscellaneous and yard.....	306.32	
257	Open hearth.....	693.89	
277	Forge and bending shop.....	816.64	
280	Cementing and tempering shop.....	725.63	
372	Machine shop.....	1,127.42	
1,528	Total.....	4,372.18	1,368,492.34



Sundays:			
	Power plant.....	\$172.35	
	Open hearth.....	231.39	
		403.74 times 52.....	\$20,989.80
Holidays: 50 per cent, \$403.74 equals \$201.82 times 7.....			1,412.74
Total.....			1,438,394.88
Pay roll per ton.....			71.92

Pay roll summary of 10,000-ton armor plant.

Em- ploy- ees.	Location.	Daily.	Annual.
8	General offices.....		\$47,500.00
16	Main office.....	\$52.12	
5	Pay and time office.....	18.80	
7	Laboratory.....	28.80	
3	Dispensary.....	7.20	
9	Blacksmith shop.....	32.40	
14	Carpenter shop.....	52.88	
50	Power plant.....	144.52	
27	Locomotive house.....	74.72	
7	Storehouse.....	20.32	
65	Miscellaneous and yard.....	185.84	
162	Open hearth.....	446.19	
161	Forge and bending shop.....	488.76	
156	Cementing and tempering shop.....	413.00	
206	Machine shop.....	629.36	
896	Total.....	2,594.91	812,206.83

Sundays and holidays.....	\$14,107.51
Total.....	873,814.34
Pay roll per ton.....	87.38

PROBABLE PAY ROLL FOR 20,000-TON AND 10,000-TON ARMOR PLANTS.

The wages per day are based on the wages now in force at similar plants and at the Naval Gun Factory.

The number of per diem employees is based on three eight-hour shifts, Sundays and holidays excluded. The pay table shows the total number, but does not divide them into shifts. Employees work 284 days a year, but are paid for 313 days. It is estimated that 145 employees would work on Sundays in the 20,000-ton plant and 94 in the 10,000-ton plant, as the power plant must be in operation, and one shift in the open hearth must be coming on at 4 p. m. to start a melt for tapping on Monday.

General offices:		Salary.
	General superintendent.....	\$15,000
	Open-hearth superintendent.....	6,000
	Forging-plant superintendent.....	5,000
	Armor-treatment superintendent.....	5,000
	Machine-shop superintendent.....	4,000
	Chief engineer of plant.....	4,000
	Metallurgist.....	6,000
	Chemist.....	2,500
Total.....		47.500

Number, 20,000- ton plant.	Number, 10,000- ton plant.	Position.	Daily wages.	Total daily wages, 20,000- ton plant.	Total daily wages, 10,000- ton plant.
MAIN OFFICE.					
1	1	Chief clerk.....	\$5.04	\$5.04	\$5.04
5	3	Stenographers.....	3.28	16.40	9.84
6	3	Clerks.....	3.72	22.32	11.16
6	3	Messengers.....	1.76	10.56	5.28
1	1	Janitor.....	2.00	2.00	2.00
2	1	Assistant janitors.....	1.76	3.52	1.76
1	1	Draftsman.....	5.04	5.04	5.04
5	3	Draftsmen.....	4.00	20.00	12.00
27	16			84.88	52.12
PAY AND TIME OFFICE.					
10	5	Clerks.....	3.76	37.60	18.80
LABORATORY.					
4	3	Assistant chemists.....	4.40	17.60	13.20
2	1	Assistant metallurgists.....	5.04	10.08	5.04
2	2	Testing-machine men.....	3.52	7.04	7.04
2	1	Clerks.....	3.52	7.04	3.52
10	7			31.76	28.80
DISPENSARY.					
3	3	Dispensary attendants.....	2.40	7.20	7.20
BLACKSMITH SHOP.					
3	1	Hammermen.....	3.60	10.80	3.60
1	1	Heater.....	3.20	3.20	3.20
5	3	Tool dressers.....	3.60	18.00	10.80
2	1	Tool temperers.....	4.00	8.00	4.00
5	3	Blacksmiths.....	3.60	18.00	10.80
16	9			58.00	32.40
CARPENTER SHOP.					
1	1	Chief carpenter.....	5.04	5.04	5.04
4	2	Pattern makers.....	4.00	16.00	8.00
12	6	Carpenters.....	3.76	45.12	22.56
6	4	Painters.....	3.44	20.64	13.76
1	1	Clerk.....	3.52	3.52	3.52
24	14			90.32	52.88
POWER PLANT.					
3	3	Foremen.....	5.04	15.12	15.12
15	9	Water tenders.....	3.28	49.20	29.52
15	9	Firemen.....	2.12	31.80	19.08
12	8	Laborers.....	1.76	21.12	14.08
3	3	Oilers.....	2.80	8.40	8.40
20	12	Repair gang.....	3.12	62.40	37.44
6	3	Engineers for generators.....	3.28	19.68	9.84
6	3	Electricians for generators.....	3.68	22.08	11.04
80	50			229.80	144.52
LOCOMOTIVE HOUSE.					
2	1	Cranemen.....	2.80	5.60	2.80
6	4	Engine drivers.....	3.04	18.24	12.16
6	4	Firemen and helpers.....	2.72	16.32	10.88
6	4	Motormen.....	2.72	16.32	10.88
4	2	Locomotive crane drivers.....	3.04	12.16	6.08
12	6	Locomotive crane drivers.....	2.00	24.00	12.00
5	3	Repair gang.....	3.52	17.60	10.56
5	3	Repair gang.....	3.12	15.60	9.36
46	27			125.84	74.72
STOREHOUSE.					
7	4	Clerks.....	3.76	26.32	15.04
6	3	Laborers.....	1.76	10.56	5.28
13	7			36.88	20.32

Number, 20,000- ton plant.	Number, 10,000- ton plant.	Position.	Daily wages.	Total daily wages, 20,000- ton plant.	Total daily wages, 10,000- ton plant.
MISCELLANEOUS (YARD).					
10	5	Bricklayers.....	\$4. 72	\$47. 20	\$23. 60
2	1	Tool-house keepers.....	2. 00	4. 00	2. 00
12	7	Track laborers.....	2. 00	24. 00	14. 00
20	12	Laborers.....	1. 76	35. 20	21. 12
3	3	Gang bosses.....	2. 72	8. 16	8. 16
8	4	Steamfitters.....	3. 60	28. 80	14. 40
12	7	Electricians.....	3. 44	41. 28	24. 08
12	7	Armature winders.....	3. 52	42. 24	24. 64
3	3	Lamp men.....	2. 72	8. 16	8. 16
2	2	Storekeepers.....	2. 56	5. 12	5. 12
6	3	Wiremen.....	3. 44	20. 64	10. 32
12	9	Watchmen.....	2. 56	30. 72	23. 04
3	2	Pipe fitters.....	3. 20	10. 80	7. 20
105	65		.....	306. 32	185. 84
OPEN-HEARTH SHOP.					
1	1	Foreman.....	8. 32	8. 32	8. 32
3	3	Foremen (sub).....	6. 32	18. 96	18. 96
15	9	Molders.....	3. 60	54. 00	32. 40
45	27	Firemen (producers).....	2. 40	108. 00	64. 80
3	3	Melters.....	6. 00	18. 00	18. 00
3	3	Melters (helpers).....	3. 04	9. 12	9. 12
6	3	Charging-machine tenders.....	3. 04	18. 24	9. 12
45	25	Pitmen.....	2. 48	111. 60	62. 00
60	40	Floor men.....	2. 00	120. 00	80. 00
12	8	Cranemen.....	2. 80	33. 60	22. 40
6	3	Scrap-yard laborers.....	2. 00	12. 00	6. 00
1	1	Scrap-yard boss.....	2. 72	2. 72	2. 72
5	3	Clerks.....	2. 52	12. 60	7. 56
1	1	Messenger.....	1. 76	1. 76	1. 76
3	3	Oilers.....	2. 80	8. 40	8. 40
3	2	Electricians.....	3. 44	10. 32	6. 88
45	27	Repair gang (furnaces).....	3. 25	146. 25	87. 75
257	162		.....	693. 89	446. 19
FORGING AND BENDING SHOP.					
1	1	Foreman.....	8. 32	8. 32	8. 32
6	4	Foremen (press).....	6. 32	37. 92	25. 28
36	24	Levermen.....	4. 00	144. 00	96. 00
15	8	Chippers.....	2. 48	37. 20	19. 84
30	15	Floormen.....	2. 00	60. 00	30. 00
18	15	Cranemen.....	2. 80	50. 40	42. 00
45	25	Heaters.....	2. 80	126. 00	70. 00
6	3	Pump engineers.....	3. 52	21. 12	10. 56
12	6	Pump engineer helpers.....	2. 72	32. 64	16. 32
40	20	Producer firemen.....	2. 40	96. 00	48. 00
3	3	Floor bosses.....	4. 00	12. 00	12. 00
12	6	Pyrometer tenders.....	2. 24	26. 88	13. 44
15	8	Scalers.....	2. 48	37. 20	19. 84
3	3	Boss heaters.....	4. 00	12. 00	12. 00
2	2	Clerks.....	2. 52	5. 04	5. 04
24	12	Repair gang.....	3. 25	78. 00	39. 00
6	3	Steamfitters.....	3. 60	21. 60	10. 80
3	3	Electricians.....	3. 44	10. 32	10. 32
277	161		.....	816. 64	488. 76
CEMENTING AND TEMPERING SHOP.					
1	1	Foreman.....	8. 32	8. 32	8. 32
42	21	Scalers.....	2. 48	104. 16	52. 08
30	15	Floormen.....	2. 00	60. 00	30. 00
15	8	Pyrometric instrument tenders.....	2. 24	33. 60	17. 92
2	2	Clerks.....	2. 52	5. 04	5. 04
15	8	Repair gang.....	3. 25	48. 75	26. 00
3	2	Electricians.....	3. 44	10. 32	6. 88
3	3	Boss heaters.....	4. 00	12. 00	12. 00
36	18	Cementing heaters.....	2. 80	100. 80	50. 40
15	8	Tempering heaters.....	2. 80	42. 00	22. 40
3	3	Floor bosses.....	4. 00	12. 00	12. 00
75	39	Producer firemen.....	2. 40	180. 00	93. 60
12	9	Cranemen.....	2. 80	33. 60	25. 20
3	2	Engineers.....	3. 52	10. 56	7. 04
6	3	Helpers.....	2. 72	16. 32	8. 16
2	2	Messengers.....	1. 76	3. 52	3. 52



Number. 20,000- ton plant.	Number, 10,000- ton plant.	Position.	Daily wages.	Total daily wages, 20,000- ton plant.	Total daily wages, 10,000- ton plant.
		CEMENTING AND TEMPERING SHOP—continued.			
2	1	Sprayers.....	\$2.52	\$5.04	\$2.52
3	2	Sand blast men.....	2.24	6.72	4.48
6	3	Oxyhydric tenders .....	2.48	14.88	7.44
3	3	Engineers (oxyhydric) .....	3.28	9.84	9.84
3	3	Helpers (oxyhydric) .....	2.72	8.16	8.16
280	156	.....		725.63	413.00
		MACHINE SHOP.			
1	1	Foreman.....	8.32	8.32	8.32
3	3	Subforemen.....	6.32	18.96	18.96
18	12	Cranemen.....	2.80	50.40	33.60
25	15	Riggers.....	3.20	80.00	48.00
150	75	Machinists.....	3.68	552.00	276.00
99	50	Machinists' helpers.....	2.00	198.00	100.00
24	15	Machinists, tool room.....	3.68	888.32	55.20
24	15	Grinders and chippers.....	2.48	59.52	37.20
1	1	Shop inspector.....	6.32	6.32	6.32
12	8	Inspectors' gang.....	2.24	26.88	17.92
6	4	Electricians.....	3.44	20.64	13.76
6	4	Tool-room tenders.....	2.00	12.00	8.00
1	1	Clerk.....	3.04	3.04	3.04
2	2	Messengers.....	1.52	3.04	3.04
372	206	.....		1,127.44	629.36

EXHIBIT B.—Metal per ton of armor.

Charge.	Unit price.	Tons.	Total value.
Bessemer pig.....	\$17.50	23.84	\$417.20
Nickel scrap.....	42.00	70.31	2,953.02
Ore.....	9.75	.27	2.63
Cinder and scale.....	6.11	.19	1.16
Ferrochrome.....	119.76	2.30	275.45
Metallie nickel.....	784.00	1.87	1,466.08
Ferrosilicon.....	43.00	.21	9.03
Spiegeleisen.....	34.00	.40	13.60
Ferromanganese.....	73.02	.61	44.54
Total.....		100.00	5,182.71
Flux:			
Limestone.....	4.65	1.14	5.30
Fluorspar.....	1.00	8.92	8.92
A. M. S. metal.....	.73	106.00	77.38
Total material, 100 tons metal charged.....			\$5,274.31
Per ton.....			52.74
Metal charged.....			Tons.
Furnace loss, 7 per cent.....			100.00
			7.00
Metal poured.....			93.00
Pit scrap, 5 per cent.....			4.65
Ingots in pit.....			88.35
Rejected ingots, 5 per cent.....			4.42
Ingots at forge (30 per cent of which are produced in form of finished plate, according to data obtained).....			83.93
Scrap (scale and oxid loss, 2.5 tons).....			56.25
Finished plate.....			25.18
Recovered, 4.65 tons pit scrap, at \$6.11.....			\$28.41
4.42 tons rejection, at \$42.....			2,548.14
56.25 tons scrap, at \$42.....			
Total credit.....			2,576.55
Total metal.....			5,274.31
Credit.....			2,576.55
25.18 tons plate.....			2,697.76
Metal in ton of plate.....			107.14

## EXHIBIT C.

*Repairs and maintenance of 20,000-ton plant.*

(a) Coal, 100,000 tons, at \$2.80 .....	\$280,000.00
Tools, lubricants.....	210,000.00
Ingot molds and materials for repairs other than below.....	174,500.00
Repairs to equipment press house, machine shop, cementing shop, materials only.....	100,000.00
Yard, laboratory, offices, materials.....	50,000.00
<hr/>	
20,000 tons.....	814,500.00
Per ton.....	40.72
(b) Upkeep of plant and buildings, and extensive overhaul repairs of furnaces and machinery, 2 per cent of installation cost, \$10,331,907. ....	206,638.00
20,000 tons, per ton.....	10.33
<hr/>	
Total annual cost of maintenance and repairs, 20,000-ton plant.....	1,021,138.00

*Repairs and maintenance of 10,000-ton plant.*

(a) Coal, 70,000 tons, at \$2.80 .....	\$196,000.00
Tools, lubricants.....	140,000.00
Ingot molds and materials for repairs other than below.....	116,000.00
Repairs to equipment press house, machine shop, cementing shop, materials only.....	65,000.00
Yard, laboratory, offices, materials.....	35,000.00
<hr/>	
10,000 tons.....	552,000.00
Per ton.....	55.00
(b) Upkeep of plant and buildings, and extensive overhaul repairs of furnaces and machinery, 2 per cent of installation cost, \$6,635,107. ....	132,702.00
10,000 tons, per ton.....	13.27
<hr/>	
Total annual cost of maintenance and repairs, 10,000-ton plant.....	684,702.00

The committee invites attention to the great difficulty of making a close estimate of the cost of manufacturing armor, in the absence of experience in such manufacture. The committee has been unable to procure from those engaged in the manufacture of armor any definite information to aid them in arriving at its cost. The above report, therefore, is made as a result of investigation by the committee in person, aided by the inspectors at the armor plants and the officers charged with the cognizance of armor in the Navy Department and from all other sources of information obtainable.

Respectfully submitted.

B. R. TILLMAN,

*Chairman Senate Committee on Naval Affairs.*

L. P. PADGETT,

*Chairman Committee on Naval Affairs, House of Representatives.*

JOSEPH STRAUSS,

*Chief of Bureau of Ordnance.*





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## APPENDIX A

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HEARINGS BEFORE A SPECIAL COMMITTEE OF THE CONGRESS  
OF THE UNITED STATES, SIXTY-THIRD CONGRESS, THIRD SES-  
SION, PURSUANT TO A PROVISION OF THE NAVAL APPRO-  
PRIATION ACT FOR THE FISCAL YEAR ENDING  
JUNE 30, 1915, AND FOR OTHER PURPOSES  
APPROVED JUNE 30, 1914

## PREFACE.

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The committee submitted a series of prepared questions to those officials of the various companies who were in a position to know the correct answers, and the questions submitted and the replies elucidated are herewith given. It will be seen from these replies that in general, no information could be had from the armor-plate manufacturers which would tend to throw any light on the cost of their product. Where answers were refused the refusal was generally based on the plea that the answer would disclose business secrets which would be advantageous to their rivals at home and abroad. The committee does not believe that a frank disclosure of the costs would work any harm to any of the firms, so far as furnishing an advantage to their rivals is concerned.

# ARMOR PLANT FOR THE UNITED STATES.

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TUESDAY, NOVEMBER 24, 1914.

SPECIAL COMMITTEE,  
*Pittsburgh, Pa.*

The committee met at 9.40 a. m., at the office of the Carnegie Steel Co., Hon. B. R. Tillman (chairman) presiding.

Present: Hon. L. P. Padgett, Member Congress, Rear Admiral J. Strauss, United States Navy, members of the committee; Lieut. Commander C. C. Bloch, United States Navy; Mr. J. B. Knight, and Mr. E. S. Theall, assistants to the committee.

There were also present Mr. A. C. Dinkey, president of the Carnegie Steel Co.; Mr. James J. Campbell, Mr. R. H. Watson, Mr. L. R. Custer, and other officials of the Carnegie Steel Co.

## STATEMENT OF MR. A. C. DINKEY, PRESIDENT OF THE CARNEGIE STEEL CO.

Mr. A. C. Dinkey, having been duly sworn, testified as follows:

The CHAIRMAN. What is your name and occupation?

Mr. DINKEY. A. C. Dinkey, president of the Carnegie Steel Co.

The CHAIRMAN. Have any newspaper men outside wanted to get in here?

Mr. DINKEY. No, sir.

The CHAIRMAN. Haven't shown any inclination or desire to get in?

Mr. DINKEY. No, sir.

The CHAIRMAN. If they apply, I wish you would give orders that they be admitted, for we want the hearing to be public.

Mr. DINKEY. Yes, sir; I will give that order right away.

(Mr. Dinkey left the room for a moment, and upon his return said: "That is arranged for. If anybody comes here at all, they will be shown in.")

The CHAIRMAN. We have prepared a list of questions before we left Washington, and I have asked Admiral Strauss to act for the committee in propounding these questions for the committee.

Q. How much does it cost your company, f. o. b., to produce a ton of K. C. armor, class A-1? That is, material, labor, and shop overhead charges.

Mr. DINKEY. I think it would be greatly against the interest of the Carnegie Steel Co., both as regards the armor makers abroad and in this country, to expose in a public record our costs.

The CHAIRMAN. Would you be willing to keep the question under advisement and answer it in writing later?

Mr. DINKEY. The idea that I had in mind was that even if you asked me to put the answer in writing I would have difficulty with it, if the answer was to be a part of a public record.

The CHAIRMAN. We are obliged to make a report to Congress of what we find, and therefore, if you want to guard any secrets you had better not tell us any secrets, either in writing or orally.

Mr. DINKEY. That was the idea I was trying to convey, that even in writing we would have difficulty with the answer if it were a part of a public record.

Q. In calculating costs do you take the annual output of a single year or of a term of years, and do you make any allowance for rejections and ballistic failures?—A. Our regular cost system is based on a calendar year's work, and of course it includes all expenses.

Q. What are the various components of this cost per ton?—A. I would like to record the answer to this question to be in harmony with my answer to the first question as to costs.

The CHAIRMAN. Mr. Dinkey understands, of course, that the stenographer will furnish him a copy of this hearing before it is made public and given to Congress, so that he will have the opportunity to amend his answers or make any corrections that he sees fit.

Mr. DINKEY. Yes, because I do not have facility in framing my answers in very good English, and I would appreciate the opportunity of looking them over.

Q. What is the cost per ton of the armor ingot at the forge, including all rejections?—A. That is a part of the original question as to costs.

Q. Give the components, with their unit prices, that enter into a furnace charge for an armor heat.—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. How much repair and preparation cost for the open-hearth furnace is made for each heat?—A. I do not think it proper to answer this, for the reasons set forth in answer to the first question as to costs.

Q. How much does this amount to per ton of armor ingot produced?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. How much does the repair and preparation cost of the ladles amount to for each ton of ingot?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What is the fuel charge for each ton of ingot?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What is the proportional laboratory superintendence charge for each ton of ingot?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.



Q. What is the lifting, stripping, and chipping charge per ton of ingot?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What is the power charge, including steam, electric, and water, for each ton of ingot?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What is the cost of forging?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What scrap allowance is made for condemned ingots?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. How many tons of armor ingots did your company manufacture last year?—A. Eighteen thousand eight hundred and thirty-one gross tons.

Q. What was the total number of these ingots in tonnage which were rejected before reaching the forge?—A. Five hundred and twenty-four gross tons.

Q. How many tons of ingots were forged during the past year?—A. Eighteen thousand three hundred and seven gross tons.

Q. How many tons of ingots were rejected during the forging?—A. None.

Q. What scrap allowance was made for those rejected during forging?—A. None rejected.

Q. What was the oxidization and scale loss at the forge?

The CHAIRMAN. I do not have any idea that you have kept any record.

Mr. DINKEY. We do not take weights before and after forging.

Q. What did the labor for forging each ton of ingot amount to?—

A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What did the fuel for each ton of ingot forged amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What did the repairs to heating furnaces amount to for each ton of armor?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What did the electric power, light, steam, water, drafting, transportation, and inspection per ton of plate amount to during the forging?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. Of all the ingots forged and not rejected, what percentage was discarded? That is, how many tons?—A. Four thousand seven hundred and forty-six gross tons.

The CHAIRMAN. Admiral, right here I think we ought to have it from the beginning.

Admiral STRAUSS. We do, sir. That is all embodied in the questions.

Q. What allowance was made for the metal thus discarded?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What is the unit price per ton of plate when ready for carbonizing?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. How many tons of armor plate were carbonized at the works of your company last year?—A. Thirteen thousand five hundred and sixty-one gross tons.

Q. What was the oxidization and scale in this treatment, in tons?—A. There are no weights taken before and after carbonizing.

Q. What was the total number of plates rejected during carbonization?—A. None.

Q. What does the labor per ton of carbonized plate amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What does the material per ton of carbonized plate amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. How much fuel per ton of plate is used in carbonizing?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. How much did the furnace repairs per ton of carbonized plate amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What does the proportional amount of steam, electric power, lighting, drafting, inspection, laboratory, and transportation amount to per ton of carbonized plate?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

The CHAIRMAN. I would imagine, Mr. Dinkey, that a good many of these questions, instead of being refused answer on account of the unwillingness of the company to expose its secrets to the world, would better be answered by saying that the records of the company were not kept sufficiently accurate for you to reply. We are asking a good many questions which you can not answer because the company did not think it worth while to keep a record of these things in the books.

Mr. DINKEY. I am obliged to you, Senator, for the thought. It was going through my mind that some of these questions are impossible to answer.

The CHAIRMAN. Not because you do not want the world to know, but because the company has not taken the precaution or did not feel it necessary to keep itself informed on these matters.

Admiral STRAUSS. Of course, there are some of them that your original answer would have to apply to.

The CHAIRMAN. And we will leave it to his discretion what he will say about those, and which ones he will leave because he does not know, and which he will leave because he does not want the world to know.

Q. How much is the carbonized plate worth per ton without machining?—A. I do not think it proper to answer this for the reasons set forth in the answer to the first question as to costs.

Q. How many tons of armor plate were reformed by your company during the past year?—A. Thirteen thousand five hundred and sixty-one gross tons.



Q. How many tons of plate were rejected during the reforging process, and was any allowance for the recovered material made in working the cost of armor?—A. Two thousand one hundred and seventy gross tons rejected. I do not think it proper to give the amount of allowance.

The CHAIRMAN. Perhaps we are suggesting a new method of book-keeping for you.

Mr. DINKEY. A new method of accounting might enable us to answer more of your questions, but be of little value to us as a manufacturer.

The CHAIRMAN. We feel compelled to probe as far as we can, to get the facts. You understand our position.

Mr. DINKEY. Certainly; you come into the thing new, and we have all this history of armor making back of us.

Q. What does the labor per ton for reforging amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What do the repairs per ton for reforging amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What does the fuel per ton for reforging amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What is the proportional amount of power—electric, steam, water—for reforging?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What does the proportional drafting, inspection, transportation, and laboratory for reforging amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. How much discard is made after reforging?—A. No discard.

Mr. PADGETT. Can you give us a general estimate from your experience in the manufacture of armor—a reasonable estimate?

Mr. DINKEY. As a matter of practice no discard is made at this point.

Mr. PADGETT. The best guess you can.

Mr. DINKEY. Answered by preceding reply.

Q. What allowance is made for this discard in reckoning the cost?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What is the cost of armor per ton after reforging?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. How many tons of armor plate were sent to treatment by your company during the past year?—A. Eleven thousand three hundred and ninety-one gross tons.

Q. How many tons were lost during treatment by rejection?—A. One thousand one hundred and fifteen gross tons.

Q. What does the labor per ton of treated plate amount to?—A. I do not think it proper to answer this for reasons set forth in answer to the first question as to costs.

Q. What does the material per ton of treated plate amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What do the repairs per ton of treated plate amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What does the fuel per ton of treated plate amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What do the proportional charges per ton of treated plate amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What is the total cost per ton of treated and rectified plate?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. How many tons of armor plate were sent to machining by your company last year?—A. Ten thousand two hundred and seventy-six gross tons.

Q. How many tons of machined plate were produced last year?—A. Six thousand two hundred and sixty-seven gross tons.

Q. Were there any rejections during the process of machining? If so, how many tons, and what allowance was made for the rejected material in reckoning the final cost?—A. Two hundred and twelve gross tons were rejected. I do not think it proper to give the amount of the allowance.

The CHAIRMAN. Right there, I think it desirable that I, as chairman, should ask you this question. In what way have you arrived at the cost of this armor to the factory upon which to base the charge to the Government for it?

Mr. DINKEY. That will start me answering the first question as to costs.

The CHAIRMAN. I feel it is my duty to find out why you charge the Government so much, and if we can not make it cheaper than you are selling it to us.

Mr. DINKEY. I can only answer in general terms, that my judgment is that the prices we have been asking are only fair and reasonable prices.

The CHAIRMAN. Is there any agreement, implied or expressed, between you and the other manufacturers of armor as to what prices shall be charged the Government?

Mr. DINKEY. None whatever.

The CHAIRMAN. You do not meet and combine instead of competing?

Mr. DINKEY. No, sir; not even a suggestion of meeting and combining.

The CHAIRMAN. You know there are only three armor manufacturers in the United States?

Mr. DINKEY. Yes, sir.

The CHAIRMAN. You know, further, that when the Navy Department first went into this armor business, some twenty-odd years ago, they had to get the Bethlehem Steel Co. to make it in this country



rather than buy it abroad, and the Bethlehem Steel Co., as I recall the facts, stated that in order to enter into the manufacture of armor they would have an extraordinary expense to incur and they would have to charge such and such a price for the armor if they made a contract with the Government, in order to reimburse themselves. The Government agreed to that price, in fact paid for the increased appliances, hammers, steam press, and all that sort of thing, and yet the price remains way up yonder—did not come down after they had provided at the Government's expense in the first contract for all these new appliances which they required in order to make armor at all. That is a matter of official record in Washington.

Mr. DINKEY. I have no information with respect to the original contract with the Bethlehem Co. I do know, however, that the armor Bethlehem started to make is not to be compared, as to quality or cost of production, with the armor we are now furnishing.

The CHAIRMAN. Do you know the origin of the contract with Carnegie?

A. I have no direct information. I understand, however, that the chief difficulties were serious delays in delivery.

The CHAIRMAN. And they had to get another factory?

Mr. DINKEY. That would help the situation, but chiefly with respect to delivery. The original contract, as I understood it, was divided at the same price that the contract was given to the Bethlehem Steel Co.; that is, the department offered the Carnegie Steel Co. the Bethlehem Steel Co.'s price if they would take a portion of the armor that had already been given to Bethlehem. That may be incorrect, but I am speaking merely from general information on the subject.

The CHAIRMAN. You are familiar with the fact, of course, that the Navy Department had to penalize Mr. Carnegie because of the failure to deliver the armor according to contract, and that President Cleveland remitted that fine?

Mr. DINKEY. Is it necessary to answer that question?

The CHAIRMAN. I think it absolutely necessary that it should go in, because it is a very important fact in this investigation.

Mr. DINKEY. I just wondered if you thought it was material to put that in. As far as my own knowledge goes, I really do not know anything about it.

The CHAIRMAN. Well, we can not save the record that fact; no, sir. We can bring it out better by going back and putting in the official documents which would prove it, and I think we will do that, Mr. Padgett, when we get back to Washington.

Mr. PADGETT. If it becomes necessary we could put them in.

The CHAIRMAN. I think it very important that the fact should be brought out officially. This history of the fine and its reduction from 15 per cent to 10 per cent by President Cleveland is found in the House Reports, second session, Fifty-third Congress, 1893-1894, volume 5. The total amount of the fine assessed was \$140,484.94, of which the informants received 25 per cent. The informants were four steel workers employed by the company. They employed a lawyer who reported to the then Secretary of the Navy, Hilary

Herbert. The Secretary appointed a board, of which Admiral Sampson was head, to investigate and report. It was upon the findings of that board that the fine of .15 per cent was assessed and reduced by President Cleveland to 10 per cent.

On the 1st of March, 1897, Senator Tillman in a speech in the Senate quoted from the Record as follows:

Q. How much per ton does the labor of machining amount to?—

A. I do not think it proper to answer this for the reasons set forth in answer to the original question as to costs.

#### THE CHARGES AGAINST THE COMPANY.

[Congressional Record, Aug. 23, 1894, p. 8638.]

First. The plates did not receive the uniform treatment required by the specifications of the contracts. In many cases the treatment was irregular, and in other cases it was practically inefficient. The specifications of the contract of February 28, 1893, required that each plate should be annealed, oil tempered, and again annealed, the last process being an annealing one.

Second. False reports of the treatment of the plates were systematically made by the Government inspectors. This was in violation of paragraph 95 of the circular concerning armor-plate appurtenances, dated January 16, 1893, which was made a part of the contract. Paragraph 95 says:

"The contractor shall state for each article in writing the exact treatment it has received."

The specifications of the contract of November 20, 1890, paragraph 164, says:

"A written statement of work and contractor's tests to be commenced and in progress each day must be furnished to the chief inspector."

Third. No bolts received the double treatment provided for in the specifications of either contract. A report of a double treatment, however, was made to the Government inspectors.

Fourth. Specimens taken from the plates both before and after treatment to ascertain the tensile strength of each plate were stretched without the knowledge of the Government inspectors, so as to increase their apparent tensile strength when actually tested.

Fifth. False specimens taken from other plates were substituted for the specimens selected by the Government inspectors.

Sixth. The testing machine was repeatedly manipulated by order of the superintendent of the armor-plate mill so as to increase the apparent tensile strength of the specimens. These specimens were juggled in measurement so as to increase their apparent ductility.

Seventh. Various specimens selected by the Government inspectors were re-treated without their knowledge before they were submitted to test.

Eighth. Plates selected by the Government inspectors for ballistic test were re-treated with the intention of improving their ballistic resistance, without the knowledge of the Government inspectors. In one case, at least, the conclusion is almost irresistible that the bottom of another plate was substituted for the top half of plate A 619 after it had been selected by the Government and while awaiting shipment to Indian Head. Upon this ballistic test a group of plates containing 348 tons, valued at about \$180,000, were to be accepted or rejected. In three cases, at least, the plates selected by the Government inspectors were re-treated in this manner without their knowledge. These ballistic plates represented 779 tons of armor, valued at over \$410,000. The groups represented by these three plates had all been submitted for premium of \$30 per ton if they passed a more severe test than required for acceptance.

Ninth. In violation of the specifications of the contract, pipes or shrinking cavities, erroneously called blowholes, in the plates were plugged by the contractors and the defects concealed from the Government inspectors. These cavities, in some cases, diminished the resistance and value of the plate.

Tenth. The inspector's stamp was either duplicated or stolen, and used without the knowledge of the Government inspectors.

Eleventh. The Government inspector in inspecting bolts was deceived by means of false templets or gauges.



Continuing, he said:

The House of Representatives sent to you a resolution to have certain plates tested upon your new Navy to prove the frauds which had been practiced upon the Government.

That resolution came over here and went to sleep and died without action, and Mr. Carnegie sports his steam yacht and floats back to Scotland to his game preserve.

Here is a list of the ships of our new Navy—our boasted new Navy, the one we love so, and that we pet so.

Four on the *Monterey*, 6 on the *Monadnock*, 8 on the *New York*, 4 on the *Amphitrite*, 3 on the *Terror*, 3 on the *Oregon*, 3 on the *Olympia*, 6 on the *Indiana*, 4 on the *Massachusetts*, and so on.

This is only a partial list of the ships the plates on which were confessed to have been plugged up, or not tempered, or some other thing which would weaken them and make them worthless, and not according to contract.

Q. How much does the machined scrap amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the original question as to costs.

Q. How much does the material for machining amount to, including oil, waste, repairing of tools, and supply of tools?—A. I do not think it proper to answer this for the reasons set forth in answer to the original question as to costs.

Q. How much do the repairs per ton of machined plate amount to during the machining operation?—A. I do not think it proper to answer this for the reasons set forth in answer to the original as to costs.

Q. What do the proportional charges per ton of machined plate amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the original question as to costs.

Q. What is the cost per ton of machined plate produced?—A. I do not think it proper to answer this for the reasons set forth in answer to the original question as to costs.

Q. How many tons of machined plate were presented by your company for shipment last year?—A. Five thousand nine hundred and nineteen gross tons.

Q. What do the labor and material for preparation for shipment amount to per ton of finished plate?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. How are the total, water, steam, power, transportation, inspection, drafting, and laboratory charges reckoned?—A. I do not think it proper to answer for the reasons set forth in answer to the first question as to costs.

Q. What were the total power charges for your plant last year—by power charges is meant electric power, steam power, water power, or producer gas for running engines, as the case may be—and how did you arrive at the method of assigning the various proportions to the various operations?—A. I do not think it proper to answer this for the reasons set forth in answer to the original question as to costs.

Q. The same information is desired for the laboratory, drafting, inspection, and transportation charges—A. I do not think it proper to answer for the reasons set forth in answer to the original question as to costs.

Q. What is the cost per ton of class B shipped plates?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What was the average cost per ton of class C steel armor?—A. This refers to bolts, nuts, etc., which we do not manufacture.

Q. What do you reckon your working capital to be?—A. I do not think it proper to answer this for the reasons set forth in answer to the original question as to costs.

Q. What does the maintenance of your plant amount to per annum?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. Is this amount over and above the repairs which have been charged to the various operations comprising the total manufacture, and separate from depreciation?—A. I do not think it proper to answer this for the reasons set forth in answer to the original question as to costs.

Q. What does this maintenance mean? To what is it applied?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. What is the total of proportional administration charges made to armor? How has this been arrived at?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. Give a tabulated list showing the various salaries paid and how proportionately divided, so as to include the armor plant.—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

The CHAIRMAN. You could not furnish that information?

Mr. DINKEY. I do not think I ought to.

The CHAIRMAN. Well, I think it would be very interesting for the outside world to know just how much the Steel Trust was able to pay its employees as compared with men of equally high intelligence and ability outside.

Q. How much did the insurance charges on your armor plant amount to?—A. I do not think it proper to answer this for the reasons set forth in answer to the original question as to costs.

Q. How much taxes are chargeable to armor plant?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

The CHAIRMAN. It appears to me that the way this investigation is going we will have no report to make at all. We are really getting little or no information and, evidently, must rely on other sources for the facts upon which to base our report.

Admiral STRAUSS. In regard to this question, "How much taxes are chargeable to the armor plant," is not such a charge part of the public records, the municipal records?

Mr. DINKEY. Our records have not subdivided the cost of taxes on the Homestead Steel Works so as to give us what proportion is properly chargeable to the armor department.

Q. How much do you charge to armor in behalf of the pension fund?—A. I do not think we have that subdivided. We charge



nothing to armor for pension fund, but we do charge a rate for protection of casualty to employees while they are sick and away owing to injuries.

Admiral STRAUSS. Insurance, then, you would call it?

Mr. DINKEY. You could call it a provision to take care of that expense.

Q. How much depreciation is charged against the armor plant?—

A. I do not think it proper to answer this for the reasons set forth in the answer to the first question as to costs.

Q. What is this depreciation and how has it been arrived at?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Q. After a year's operations within which a certain sum of money has been set aside from the proceeds of the manufacture of armor for depreciation charge, what is done with this money?—A. I do not think it proper to answer this for the reasons set forth in the answer to the first question as to costs.

Q. After depreciation charge has been made to a year's operation, and there have been no replacements of tools, is this amount used to amortize the original investment?—A. I do not think it proper to answer this for the reasons set forth in answer to the original question as to costs.

Q. Since the erection of your armor plant what has been the total amount of depreciation which has been charged into the cost of armor?—A. I do not think it proper to answer for the reasons set forth in answer to the original question as to costs.

Q. How much, if any, of this sum of money has been actually used for the installation of new machinery in place of old, for building new buildings, furnaces, etc., in place of old, and has this expenditure been added to the capital account?—A. I do not think it proper to answer this for the reasons set forth in answer to the original question as to costs.

Q. The remainder of this sum of money which has not been expended, has it been used for amortizing any of the original investment?—A. I do not think it proper to answer for the reasons set forth in the answer to the first question as to costs.

Q. How much money is invested in your armor plant?—A. This question is answered later.

Q. Does this represent the total amount which has been expended for this plant, inclusive of all depreciation replacements?—A. It does not include depreciation replacements.

Q. In reckoning your profit, is it reckoned as a profit on the total amount of money which has been put into the armor plant or on the amount which has been put into the armor plant less all depreciation which has not been used for the purpose of replacement?—A. I do not think it proper to answer this for the reasons set forth in answer to the first question as to costs.

Mr. PADGETT. I wanted to ask a question, please. In 1897 Mr. Schwab appeared before the committee that was investigating at that time and he stated:

It is a very difficult thing to fix the price of any article in which quantity and quality do not enter. Quantity and quality are the two essential things in fixing

the price of any article. Quantity is, as I have pointed out to you, especially important. We have only made 2,000 tons per year at the bare cost of 50 per cent higher tonnage. I am prepared to say that if you will give us 3,000 tons of armor per year, as estimated, we will give you a rebate of \$50 per ton upon every ton over that quantity. If you will give us 3,500 tons of armor per year, we will give you a rebate of \$100 per ton for every ton over that quantity.

Now, in connection with that statement that was made there, the last contract that was awarded was for 25,000 tons, divided, I believe, between two concerns. There were 25,000 tons awarded, two-thirds of it going to the Bethlehem Steel Co. and one-third to the Midvale Steel Co. I wanted to ask you what would be a reasonable reduction on the basis of 16,000 tons to one and 8,000 tons to the other, in comparison with the rebates or reductions, as stated in the answer of Mr. Schwab?

The CHAIRMAN. Proposed to be given.

Mr. PADGETT. Yes; proposed to be given.

Mr. DINKEY. I think Mr. Schwab ought to answer that. He had, of course, some particular thing in his mind when he made that statement.

The CHAIRMAN. Mr. Schwab isn't in America just now?

Mr. DINKEY. I think he is. He has just landed.

Mr. PADGETT. I would like to ask if you would give any expression of your opinion if they could not have reduced the price reasonably below \$425 a ton on getting so large an order?

Mr. DINKEY. My judgment is that they could not; \$450 per ton is a reasonable price for the quality of armor now demanded by the United States Government.

Mr. PADGETT. In 1894 Mr. Frick was testifying before a committee, and he testified:

"When we went into the manufacture of armor we had a rolling mill, which is a very extensive mill, I think probably the largest of its kind in the world. In addition to that, not including the ground, we purchased a larger piece of valuable ground. We spent \$2,600,000, so I think that you can safely say we have invested in the manufacture of armor \$4,000,000."

Then a question was asked:

"But since you have begun the manufacture you have put in this machinery, or rather, since you accepted this contract you have put in this machinery?"

And then a question was asked:

That would account in a great measure for the \$3,000,000 expended for the plant. If you had known exactly what you would have required, it might be that the plant would not have cost so much?

Answer:

"I believe that the plant could be duplicated for somewhat less, but not very much less. In 1906 the Carnegie Co. estimated its total investment in armor plant at \$5,905,425."

This estimate includes \$4,730,425 as the actual cost of construction in armor plant since its commencement, as shown on the books of the company, and added \$1,175,000 as the allowed cost of the land occupied. Now, since that time can you state what the company has paid in to increase the plant of the company, not paid out of the profits of the company?



Mr. DINKEY. Well, of course, I can say what has been added since 1906. I can tell you what has been added to our factory equipment since 1906, if you leave out "not paid out of the profits." Of course, the profits are in the profit and loss account, and they do not stand in a separate fund; they stand in one fund.

Mr. PADGETT. I will ask you to put in a statement of what you have added to the capital of the company since 1906.

Mr. DINKEY. Instead of capital can you make it what we have added to the factory? What additions have been made to the factory?

Mr. PADGETT. Yes.

Mr. DINKEY. Because we have not changed our capital account. We do not change that, but I can put in what additions have been made to the factory.

Admiral STRAUSS. Do you mean what additions have been made in buildings and machinery?

Mr. DINKEY. Yes; new equipment, if any. A few tools have been bought, and I think there are some extensions to the treating shop. There are quite important extensions to the treating shop.

Admiral STRAUSS. You say that is not charged to your account of capital invested in the production of armor?

Mr. DINKEY. No; that part of our bookkeeping is not changed. You see the Carnegie Steel Co.'s capital is a fixed amount.

Admiral STRAUSS. I mean to your investment in the armor business proper.

Mr. DINKEY. It is set up against our investment account; yes. And the investment account and additions to the property are the same thing, the two items are the same.

Admiral STRAUSS. You say you propose to give these additional investments?

Mr. DINKEY. Yes.

Admiral STRAUSS. By items?

Mr. DINKEY. I will subdivide it so that it is legible to you. I think I will put it "Extensions to the treating shop" and "New tools," and then I will show what they are and will add them to the 1906 figures.

Admiral STRAUSS. Will you give your additions of furnaces?

Mr. DINKEY. We will give the number of furnaces and the cost per furnace in such a way that you can see the cost per furnace. I find that, as stated by Mr. Padgett, we reported in 1906 that we estimated our total investment in our armor plant and auxiliary facilities up to December 31, 1905, as being \$5,905,425, which included the sum of \$450,000 for about 30 acres of land used for the plant, the balance covering buildings, furnaces, presses, and all other tools and appliances. Since that time we have expended for additions (not replacements), \$220,421.44 made up of the following items:

Press shop—manipulator.....	\$7, 779. 21
Extensions and additions to carbonizing shop.....	121, 099. 70
Additions to machine shop:	
Two milling machines.....	\$47, 331. 25
One pit planer.....	18, 274. 64
One boring mill.....	4, 859. 85
One 125-ton crane.....	21, 076. 79
	<hr/> 91, 542. 53

This brings our total investment, at the present time, up to \$6,125,846.44. It appears from the foregoing list of additions that we have not added any furnaces since 1906. Considerable additions have been made to the general facilities of the plant, such as cars, stocking tools, etc., which are employed only a portion of the time in the process of armor making. No portion of the amount of these expenditures is included in the above statement.

The CHAIRMAN. Mr. Dinkey, it would appear to be the case that the system of bookkeeping does not admit of any analysis of the cost of armor, and I am afraid we would never get at the real facts even if we should have full access to your books or have an expert go through them.

Mr. DINKEY. I think you would have difficulty in using our figures to any advantage to yourselves; I think that is true.

The CHAIRMAN. You realize that our duty to the people is diametrically opposed to your ideas of your duty to the Carnegie Steel Co., the Steel Trust, as it is called. You feel bound to protect your employers or your bosses, whoever they are, and we feel bound to protect our bosses who have sent us here. To that extent the two interests are opposed.

Mr. DINKEY. Of course a natural opposition is there; at the same time I am not conscious of interposing greater objections than seem to be necessary under the circumstances.

The CHAIRMAN. Would you be willing for a naval expert accountant to go through your books?

Mr. DINKEY. I would not be willing.

Admiral STRAUSS. Mr. Dinkey, do you think that your system of bookkeeping properly accounts for everything, every cost that should be allotted to the production of armor, in such a way as to permit you to give an intelligent bid for armor? That is, do you know yourselves exactly what that armor costs, including your material, labor, shop overhead, and all administrative and depreciation expenses?

Mr. DINKEY. Of course, I think it does, within a proper meaning of that question; I think it does.

Mr. PADGETT. Returning to the question I asked a while ago about the increase to your investment or to the enlargement of your plant, etc. Will you state whether or not it was paid out of the amount that was set apart as depreciation to the plant, or whether it was paid out of the general profits?

Mr. DINKEY. In an informal way, I will say that these funds are not kept separate, they are paid out of the general funds of the Carnegie Steel Co.

Mr. PADGETT. Do you charge up as an item of cost in the manufacture of armor a per cent or an item known as depreciation of plant?

Mr. DINKEY. We have a heading. Our system is not to charge directly into the individual costs an item of depreciation. We deduct that from the profit and loss. But we do, of course, reckon with that factor whenever we are estimating to arrive at a total cost for selling purposes.



Mr. PADGETT. Along the same line can you state, since you commenced the manufacture of armor, whether the aggregate of the amount that you have charged as depreciation of plant is more or less than the amount that has been expended for the extension and improvement of the plant?

Mr. DINKEY. I find it impossible to answer this question.

The CHAIRMAN. When did the Midvale people commence to make armor?

Mr. DINKEY. About the year 1906.

The CHAIRMAN. I recall that up to the time that the Midvale people came forward with their bids the Government considered itself helpless and had to pay whatever Carnegie and Bethlehem charged them.

Mr. DINKEY. I have no information as to the situation in which the Government considered itself to be.

The CHAIRMAN. There seems to have been no difficulty whatever, because you had the Government in your power and could compel it to accept your price or go without, and the idea I have is that the only protection the Government can have is to build an armor plant of its own, the same as we have built a powder plant. It may be that the European war will demonstrate that armor is no longer needed at all.

Mr. DINKEY. We never considered that the Government was in our power. Our necessities as sellers were greater than the Government's necessities as a buyer. If the European war does so demonstrate, that will dispose of the whole question.

The CHAIRMAN. We will quit building battleships, but it will not dispose of you, because the Steel Trust will be here when I am dead and gone, and perhaps when you are dead and gone. You declined a little while ago to allow us to send a naval expert accountant to go through your books. Does not the law give the Department of Commerce that power now?

Mr. PADGETT. I do not know, Senator.

The CHAIRMAN. Has anybody investigated this plant before?

Mr. CAMPBELL. There have been a number of investigators from the Navy Department on the job at different times. You will remember the Alger Board was down there. One time they followed our figures up to that time as to investment in armor plant. Then there was the Niles Board, and they got a lot of information.

Mr. DINKEY. Then McLean, afterwards McLean & McVay. Before an armor contract is let the question of the quality of the armor to be supplied is always a feature of the discussion. The Government does not find itself so helpless with respect to pushing up the quality required. The Government is not in a helpless position by any means. A seller has to sell just as much as a buyer has to buy. I have to find customers.

The CHAIRMAN. Provided you keep on making armor. But if you turned your plant to some other purpose——

Mr. DINKEY (interposing). No; that is not true, Senator.

The CHAIRMAN. You have got some appliances down there that are needed only for making armor?

Mr. DINKEY. Yes, sir; and they can not be used for anything else.

The CHAIRMAN. And therefore, they would be a dead loss to you if the Government should go into the manufacture of its own armor. The Government is helpless, so far as the price of armor is concerned, when there are only three makers of it, and they are working in combination, charging whatever price they agree upon.

Mr. DINKEY. The three are not in collusion.

The CHAIRMAN. You say so, but we think they are. I hope you are telling the truth.

Mr. DINKEY. I can tell you now that they are not in collusion, and I do not know how I can make you believe that I am telling the truth.

The CHAIRMAN. The fact that Carnegie did not get any of this last contract would indicate that some how or other the cogs had slipped and the machine did not work well. Do you know just why you did not get it? Are you willing to tell?

Mr. DINKEY. I tried hard enough to get it, but could not. I tried to meet the Secretary's views, and I did revise my bids after he asked us to, and I did not make them sufficiently low, I imagine.

Mr. PADGETT. Upon that question, however, the contract was awarded to the other two with the stipulation that they could sublet part of the contract, and you are not out of the game yet.

Mr. DINKEY. The deliveries required are faster than the plants that have the contracts will be able to make them.

The CHAIRMAN. Therefore they will have to come to you because you are the only other man that can help them out. Don't you see that you have got the Government in your power?

Mr. DINKEY. I do not think I have.

The CHAIRMAN. If the Government can only get from certain factories its armor, and nobody else can supply it, it seems to me that the Government is utterly helpless.

Mr. DINKEY. Look at the other side. These tools are useful only for Government work. If the Government does not buy they stand idle.

The CHAIRMAN. What is the exact cost of that class of tools?

Mr. DINKEY. Approximately \$5,000,000.

The CHAIRMAN. Will you supply that estimation?

Mr. DINKEY. Yes; practically all the equipment which we call the armor department is useful only for making armor.

The CHAIRMAN. Can you not adapt it to some other manufacture?

Mr. DINKEY. No, sir.

The CHAIRMAN. It would be a dead loss to you, then, if the Government should go into the manufacture of its own armor?

Mr. DINKEY. We would have to tear it out and throw it away and find something else to put up on that ground.

Admiral STRAUSS. We have a number of questions prepared as to the cost of plant. You just stated that you would give us some information. I would like to put these questions for such answers as Mr. Dinkey will give.

Mr. PADGETT. I would like to ask a question. Would you object to informing the committee as to the total amount that you pay per annum to your foreman of the armor department?



Mr. DINKEY. The heads of the departments? I would rather not. I think we ought not to do that.

Mr. PADGETT. The superintendent of the armor department. I was not interested in any other case, just the armor department.

Mr. DINKEY. I would like to tell the committee if I could tell them for their own information but not a part of the record.

Mr. PADGETT. Of course, you can understand that from our standpoint the item of salaries is one to be considered by the Government in connection with the question of the advisability or nonadvisability of establishing a plant, and also as to the cost of armor—what we would be expected to pay the men who performed certain duties in the manufacture of armor.

Mr. DINKEY. Yes, this item of salaries is one that you will want to be accurately informed about.

Mr. PADGETT. And for that reason I was asking the question.

Mr. DINKEY. I would not like to make a public record of these salaries.

The CHAIRMAN. Does it require any special skill?

Mr. DINKEY. Oh, yes; most of these men have spent their lifetime at it.

Admiral STRAUSS. What is the capacity of the company's plant for armor in tons per year?

Mr. DINKEY. Approximately 10,000 gross tons.

Admiral STRAUSS. How much has this plant cost the company to date, for buildings and machinery?

Mr. DINKEY. This question has been answered.

Admiral STRAUSS. This sum to include all buildings and all machinery and equipment now installed, exclusive of site?

Mr. DINKEY. This question has been answered.

Admiral STRAUSS. How many acres are now occupied by your plant, including space for stock and coal storage?

Mr. DINKEY. About 30 acres.

Admiral STRAUSS. I would like to ask you what does your plant for the production of special-treatment steel plates cost you? How much have you invested in that department?

Mr. DINKEY. It is almost impossible to separate the cost. More than half of the course of manufacture required for the production of special-treatment plate uses the common tools of the Carnegie Steel Co.

The CHAIRMAN. If I understand you, there is no mystery or very great expense attached to it, other than ordinary?

Mr. DINKEY. The first part of it is right. There is very little mystery, but there is a whole lot of expense.

The CHAIRMAN. We are concerned with both the mystery and the expense.

Mr. DINKEY. There is very little mystery. Of course, that word is not proper to use in connection with manufacturing steel. There is no mystery at all; just plain skill and expensive material.

The CHAIRMAN. When we first began to look into this armor business, 20 years ago, nickel was considered a very important and necessary ingredient.

Mr. DINKEY. It was. That came out immediately upon the——

The CHAIRMAN (interposing). Nickel is still used in its manufacture?

Mr. DINKEY. Yes, sir.

The CHAIRMAN. And afterwards Harvey came in with some patents?

Mr. DINKEY. And improved the armor that was being bought at that time.

The CHAIRMAN. That is still used, the Harvey process?

Mr. DINKEY. That process is still used, except as another process has been added to it.

The CHAIRMAN. Improving even that?

Mr. DINKEY. Improving even that.

The CHAIRMAN. So you use both?

Mr. DINKEY. All three of them are represented in the present armor; the nickel which was originally used, and the Harvey, which was put on top of the nickel, and the Krupp process, which is put on top of the Harvey. All three of them are combined in the present armor.

The CHAIRMAN. Are any of these patented?

Mr. DINKEY. They all were patented, but I think they expired by limitation.

The CHAIRMAN. Therefore, the Government could use any or all of them without any additional expense?

Mr. DINKEY. I think the processes that were patented at that time are now public property. I think that is true.

Admiral STRAUSS. How many men are employed in your armor department?

Mr. DINKEY. Approximately 750 men.

Admiral STRAUSS. How many shifts are worked.

Mr. DINKEY. Three shifts.

Mr. PADGETT. Mr. Dinkey, could you give us a reasonable estimate of what would be the additional cost of a plant capable of manufacturing special-treatment steel, in addition to a strictly armor-plate plant? In other words, if the Government should establish an armor-plate factory, how much additional would it cost to add a plant that would make special treatment steel of 1½ inches and then 3 inches in thickness?

Mr. DINKEY. I will give you what I will consider a reasonable estimate.

Mr. PADGETT. Of what that additional would cost?

Mr. DINKEY. Yes.

Mr. PADGETT. I should be glad if you would.

Admiral STRAUSS. And what the total capacity would be per annum.

Mr. DINKEY. Just let me explain some of the difficulties there. I mentioned a little while ago that to make special-treatment plates we used in the early stages of its manufacture, clear up until it becomes an actual plate ready for tempering, the common tools of the Carnegie Steel Co., and you can not use anything else. A plate mill in which these plates are rolled has a capacity of 15,000 tons a month. Well, it can not be a smaller plate mill. So whatever the Government



will need to buy—say, 8,000 or 10,000 or 12,000 tons of these plates per year on a two-ship program or a three-ship program—you could not build a plate mill with a capacity of less than 15,000 tons a month, and the tools would be standing idle the rest of the year. It would roll less than a month all you could possibly use on a three-ship program in any year.

The CHAIRMAN. That answer would seem to indicate that it would be preposterous for the Government to go into the manufacture of special-treatment steel. It could buy the plates and treat them in its own plant?

Mr. DINKEY. It could do that and it would be a more practical thing to do. It is almost impracticable to add a special-treatment plant to an armor plant.

The CHAIRMAN. But assuming that it would, I wanted you to give us what that additional cost would be.

Mr. DINKEY. After careful consideration I have come to the conclusion that it is impossible to set up an estimate that would be of any practical value.

The CHAIRMAN. You can not make special-treatment steel unless you treat it like armor?

Mr. DINKEY. You can not; that is the finishing process.

The CHAIRMAN. But you can make it out of regular plate steel, and plate mills are plentiful. We can buy plate steel almost anywhere and treat it afterwards, if we had an armor plant to treat it in?

Mr. DINKEY. That would be the more practical proposition.

Admiral STRAUSS. In consideration of the fact that some of these questions as submitted, and perhaps some more that will be submitted, will have to be answered by others than Mr. Dinkey, it has been suggested that the other gentlemen who are here to testify be sworn and their answers sent by mail.

#### STATEMENT OF MR. LOUIS R. CUSTER.

Mr. L. R. Custer, being duly sworn, testified as follows:

The CHAIRMAN. What is your name?

Mr. CUSTER. Louis R. Custer.

The CHAIRMAN. What is your official connection with the Carnegie Steel Co.?

Mr. CUSTER. Superintendent of the armor-plate department of Homestead Steel Works.

Q. How much does it cost your company, f. o. b., to produce a ton of K. C. armor, Class A-1? That is, material, labor, and shop overhead charges?—A. I have nothing to do with matters pertaining to costs, and never see the cost records.

Q. How much do you add to this cost for deterioration of plant and administration?—A. I do not know.

Q. In calculating costs, do you take the annual output of a single year or of a term of years, and do you make any allowance for rejections and ballistic failures?—A. I do not know.

Q. What are the various components of this cost per ton?—A. I do not know.

Q. What is the cost per ton of the armor ingot at the forge, including all rejections?—A. I do not know.

Q. Give the components, with their unit prices, that enter into a furnace charge for an armor heat.—A. I do not know.

Q. How much repair and preparation cost for the open-hearth furnace is made for each heat?—A. I do not know.

Q. How much does this amount to per ton of armor ingot produced?—A. I do not know.

Q. How much does the repair and preparation cost of the ladles amount to for each ton of ingot?—A. I do not know.

Q. What is the fuel charge for each ton of ingot?—A. I do not know.

Q. What is the proportional laboratory superintendence charge for each ton of ingot?—A. I do not know.

Q. What is the lifting, stripping, and chipping charge per ton of ingot?—A. I do not know.

Q. What is the power charge, including steam, electric, and water, for each ton of ingot?—A. I do not know.

Q. What is the cost for forging?—A. I do not know.

Q. What scrap allowance is made for condemned ingots?—A. I do not know.

Q. How many tons of armor ingots did your company manufacture last year?—A. Eighteen thousand eight hundred and thirty-one gross tons.

Q. What was the total number of these ingots in tonnage which were rejected before reaching the forge?—A. Five hundred and twenty-four gross tons.

Q. How many tons of ingots were forged during the past year?—A. Eighteen thousand three hundred and seven gross tons.

Q. How many tons of ingots were rejected during the forging?—A. None.

Q. What scrap allowance was made for these rejected during forging?—A. None rejected.

Q. What was the oxidization and scale loss at the forge?—A. We do not take such record.

Q. What did the labor for forging each ton of ingot amount to?—A. I do not know.

Q. What did the fuel for each ton of ingot forged amount to?—A. I do not know.

Q. What did the repairs to heating furnaces amount to for each ton of armor?—A. I do not know.

Q. What did the electric power, light, steam, water, drafting, transportation, and inspection per ton of plate amount to during the forging?—A. I do not know.

Q. Of all the ingots forged and not rejected, what percentage was discarded—that is, how many tons?—A. Four thousand seven hundred and forty-six gross tons.

Q. What allowance was made for the metal thus discarded?—A. I do not know.

Q. What is the unit price per ton of plate when ready for carbonizing?—A. I do not know.



Q. How many tons of armor plate were carbonized at the works of your company last year?—A. Thirteen thousand five hundred and sixty-one gross tons.

Q. What was the oxidization and scale in this treatment, in tons?—A. No record kept.

Q. What was the total number of plates rejected during carbonization?—A. None.

Q. What does the labor per ton of carbonized plate amount to?—A. I do not know.

Q. What does the material per ton of carbonized plate amount to?—A. I do not know.

Q. How much fuel per ton of plate is used in carbonizing?—A. I do not know.

Q. How much did the furnace repairs per ton of carbonized plate amount to?—A. I do not know.

Q. What does the proportional amount of steam, electric power, lighting, drafting, inspection, laboratory, and transportation amount to per ton of carbonized plate?—A. I do not know.

Q. How much is the carbonized plate worth per ton without machining?—A. I do not know.

Q. How many tons of armor plate were reformed by your company during the past year?—A. Thirteen thousand five hundred and sixty-one gross tons.

Q. How many tons of plate were rejected during the reforming process, and was any allowance for the recovered material made in working the cost of armor?—A. Two thousand one hundred and seventy tons. The usual scrap allowance was made, but I know nothing about the amounts so allowed.

Q. What does the labor per ton for reforming amount to?—A. I do not know.

Q. What do the repairs per ton for reforming amount to?—A. I do not know.

Q. What does the fuel per ton for reforming amount to?—A. I do not know.

Q. What is the proportional amount of power—electric, steam, water—for reforming?—A. I do not know.

Q. What does the proportional drafting, inspection, transportation, and laboratory for reforming amount to?—A. I do not know.

Q. How much discard is made after reforming?—A. None.

Q. What allowance is made for this discard in reckoning the cost?—A. No such discard.

Q. What is the cost of armor per ton after reforming?—A. I do not know.

Q. How many tons of armor plate were sent to treatment by your company during the past year?—A. Eleven thousand three hundred and ninety-one gross tons.

Q. How many tons were lost during treatment by rejection?—A. One thousand one hundred and fifteen gross tons.

Q. What does the labor per ton of treated plate amount to?—A. I do not know.

Q. What does the material per ton of treated plate amount to?—

A. I do not know.

Q. What do the repairs per ton of treated plate amount to?—

A. I do not know.

Q. What does the fuel per ton of treated plate amount to?—A. I do not know.

Q. What do the proportional charges per ton of treated plate amount to?—A. I do not know.

Q. What is the total cost per ton of treated and rectified plate?—

A. I do not know.

Q. How many tons of armor plate were sent to machining by your company last year?—A. Ten thousand two hundred and seventy-six gross tons.

Q. How many tons of machined plate were produced last year?—

A. Six thousand two hundred and sixty-seven gross tons.

Q. Were there any rejections during the process of machining; if so, how many tons, and what allowance was made for the rejected material in reckoning the final cost?—A. Two hundred and twelve gross tons rejected. Usual scrap allowance made, but I do not know the amounts of such allowance.

Q. How much per ton does the labor of machining amount to?—

A. I do not know.

Q. How much does the machined scrap amount to?—A. I do not know.

Q. How much does the material for machining amount to, including oil, waste, repairing of tools, and supply of tools?—A. I do not know.

Q. How much do the repairs per ton of machined plate amount to during the machining operations?—A. I do not know.

Q. What do the proportional charges per ton of machined plate amount to?—A. I do not know.

Q. What is the cost per ton of machined plate produced?—A. I do not know.

Q. How many tons of machined plate were presented by your company for shipment last year?—A. Five thousand nine hundred and nineteen gross tons.

Q. What do the labor and material for preparation for shipment amount to per ton of finished plate?—A. I do not know.

Q. How are the total water, steam, power, transportation, inspection, drafting, and laboratory charges reckoned?—A. I do not know.

Q. What were the total power charges for your plant last year—by power charges is meant electric power, steam power, water power, or producer gas for running engines, as the case may be—and how did you arrive at the method of assigning the various proportions to the various operations?—A. I do not know.

Q. The same information is desired for the laboratory, drafting, inspection, and transportation charges?—A. I do not know.

Q. What is the cost per ton of class A-2 shipped plates?—A. I do not know.

Q. What is the cost per ton of Class B shipped plates?—A. I do not know.



Q. What was the average cost per ton of Class C steel armor?—  
A. We do not make it.

Q. What do you reckon your working capital to be?—A. I do not know.

Q. What does the maintenance of your plant amount to per annum?—A. I do not know.

Q. Is this amount over and above the repairs which have been charged to the various operations comprising the total manufacture, and separate from depreciation?—A. I do not know.

Q. What does this maintenance mean? To what is it applied?—  
A. I do not know.

Q. What is the total of proportional administration charges made to armor? How has this been arrived at?—A. I do not know.

Q. Give a tabulated list showing the various salaries paid and how proportionately divided, so as to include the armor plant.—A. I do not know.

Q. How much did the insurance charges on your armor plant amount to?—A. I do not know.

Q. How much taxes are chargeable to the armor plant?—A. I do not know.

Q. How much do you charge to armor in behalf of the pension fund?—A. I do not know.

Q. How much depreciation is charged against the armor plant?—  
A. I do not know.

Q. What is this depreciation and how has it been arrived at?—  
A. I do not know.

Q. After a year's operations within which a certain sum of money has been set aside from the proceeds of the manufacture of armor for depreciation charge what is done with this money?—A. I do not know.

Q. After depreciation charge has been made to a year's operation, and there have been no replacements of tools, is this amount used to amortize the original investment?—A. I do not know.

Q. Since the erection of your armor plant what has been the total amount of depreciation which has been charged into the cost of the armor?—A. I do not know.

Q. How much, if any, of this sum of money has been actually used for the installation of new machinery in place of old, for building new buildings, furnaces, etc., in place of old, and has this expenditure been added to the capital account?—A. I do not know.

Q. The remainder of this sum of money which has not been expended, has it been used for amortizing any of the original investment?—  
A. I do not know.

Q. How much money is invested in your armor plant?—A. I do not know.

Q. Does this represent the total amount which has been expended for this plant, inclusive of all depreciation replacements?—A. I do not know.

Q. In reckoning your profit is it reckoned as a profit on the total amount of money which has been put into the armor plant or on the amount which has been put into the armor plant less all depreciation which has not been used for the purpose of replacement?—A. I do not know.

## STATEMENT OF MR. RALPH H. WATSON.

Mr. R. H. Watson, being duly sworn, testified as follows:

The CHAIRMAN. What is your name?

Mr. WATSON. Ralph H. Watson.

The CHAIRMAN. What is your official connection with the Carnegie Steel Co.?

Mr. WATSON. Assistant general superintendent of Homestead Steel Works of Carnegie Steel Co.

Q. How much does it cost your company, f. o. b., to produce a ton of K. C. armor, class A-1? That is, material, labor, and shop-overhead charges?—A. I do not have access to the records of cost of the manufacture of armor. Such records are kept in the general offices of the company in Pittsburgh. I am, therefore, unable to answer the question.

Q. How much do you add to this cost for deterioration of plant and administration?—A. I do not know.

Q. In calculating costs do you take the annual output of a single year or of a term of years, and do you make any allowance for rejections and ballistic failures?—A. I do not know.

Q. What are the various components of this cost per ton?—A. I do not know.

Q. What is the cost per ton of the armor ingot at the forge, including all rejections?—A. I do not know.

Q. Give the components, with their unit prices, that enter into a furnace charge for an armor heat.—A. I do not know.

Q. How much repair and preparation cost for the open-hearth furnace is made for each heat?—A. I do not know.

Q. How much does this amount to per ton of armor ingot produced?—A. I do not know.

Q. How much does the repair and preparation cost of the ladles amount to for each ton of ingot?—A. I do not know.

Q. What is the fuel charge for each ton of ingot?—A. I do not know.

Q. What is the proportional laboratory superintendence charge for each ton of ingot?—A. I do not know.

Q. What is the lifting, stripping, and chipping charge per ton of ingot?—A. I do not know.

Q. What is the power charge, including steam, electric, and water, for each ton of ingot?—A. I do not know.

Q. What is the cost for forging?—A. I do not know.

Q. What scrap allowance is made for condemned ingots?—A. I do not know.

Q. How many tons of armor ingots did your company manufacture last year?—A. 18,831 gross tons.

Q. What was the total number of these ingots in tonnage which were rejected before reaching the forge?—A. Five hundred and twenty-four gross tons.

Q. How many tons of ingots were forged during the past year?—A. Eighteen thousand three hundred and seven gross tons.

Q. How many tons of ingots were rejected during the forging?—A. None.



Q. What scrap allowance was made for those rejected during forging?—A. None rejected.

Q. What was the oxidization and scale loss at the forge?—A. Such records are not made.

Q. What did the labor for forging each ton of ingot amount to?—A. I do not know.

Q. What did the fuel for each ton of ingot forged amount to?—A. I do not know.

Q. What did the repairs to heating furnaces amount to for each ton of armor?—A. I do not know.

Q. What did the electric power, light, steam, water, drafting, transportation, and inspection per ton of plate amount to during the forging?—A. I do not know.

Q. Of all the ingots forged and not rejected, what percentage was discarded; that is, how many tons?—A. Four thousand seven hundred and forty-six gross tons.

Q. What allowance was made for the metal thus discarded?—A. I do not know.

Q. What is the unit price per ton of plate when ready for carbonizing?—A. I do not know.

Q. How many tons of armor plate were carbonized at the works of your company last year?—A. Thirteen thousand five hundred and sixty-one gross tons.

Q. What was the oxidation and scale in this treatment in tons?—A. We do not keep a record of it.

Q. What was the total number of plates rejected during carbonization?—A. None.

Q. What does the labor per ton of carbonized plate amount to?—A. I do not know.

Q. What does the material per ton of carbonized plate amount to?—A. I do not know.

Q. How much fuel per ton of plate is used in carbonizing?—A. I do not know.

Q. How much did the furnace repairs per ton of carbonized plate amount to?—A. I do not know.

Q. What does the proportional amount of steam, electric power, lighting, drafting, inspection, laboratory, and transportation amount to per ton of carbonized plate?—A. I do not know.

Q. How much is the carbonized plate worth per ton without machining?—A. I do not know.

Q. How many tons of armor plate were reformed by your company during the past year?—A. Thirteen thousand five hundred and sixty-one gross tons.

Q. How many tons of plate were rejected during the reforming process, and was any allowance for the recovered material made in working the cost of armor?—A. Two thousand one hundred and seventy gross tons. The usual scrap allowance was made, but I do not know the amount.

Q. What does the labor per ton for reforming amount to?—A. I do not know.

Q. What do the repairs per ton for reforming amount to?—A. I do not know.

Q. What does the fuel for reforging amount to?—A. I do not know.

Q. What is the proportional amount of power—electric, steam, water—for reforging?—A. I do not know.

Q. What does the proportional drafting, inspection, transportation, and laboratory for reforging amount to?—A. I do not know.

Q. How much discard is made after reforging?—A. No discard is made after reforging.

Q. What allowance is made for this discard in reckoning the cost?—A. No discard made.

Q. What is the cost of armor per ton after reforging?—A. I do not know.

Q. How many tons of armor plate were sent to treatment by your company during the past year?—A. Eleven thousand three hundred and ninety-one gross tons.

Q. How many tons were lost during treatment by rejections?—A. One thousand one hundred and fifteen gross tons.

Q. What does the labor per ton of treated plate amount to?—A. I do not know.

Q. What does the material per ton of treated plate amount to?—A. I do not know.

Q. What do the repairs per ton of treated plate amount to?—A. I do not know.

Q. What does the fuel per ton of treated plate amount to?—A. I do not know.

Q. What do the proportional charges per ton of treated plate amount to?—A. I do not know.

Q. What is the total cost per ton of treated and rectified plate?—A. I do not know.

Q. How many tons of armor plate were sent to machining by your company last year?—A. Ten thousand two hundred and seventy-six gross tons.

Q. How many tons of machined plate were produced last year?—A. Six thousand two hundred and sixty-seven gross tons.

Q. Were there any rejections during the process of machining? If so, how many tons, and what allowance was made for the rejected material in reckoning the final cost?—A. Two hundred and twelve gross tons were rejected during the process of machining. Do not know the amount of allowance made for the rejected material.

Q. How much per ton does the labor of machining amount to?—A. I do not know.

Q. How much does the machined scrap amount to?—A. I do not know.

Q. How much does the material for machining amount to, including oil, waste, repairing of tools, and supply of tools?—A. I do not know.

Q. How much do the repairs per ton of machined plate amount to during the machining operations?—A. I do not know.

Q. What do the proportional charges per ton of machined plate amount to?—A. I do not know.

Q. What is the cost per ton of machined plate produced?—A. I do not know.



Q. How many tons of machined plate were presented by your company for shipment last year?—A. Five thousand nine hundred and nineteen gross tons.

Q. What do the labor and material for preparation for shipment amount to per ton of finished plate?—A. I do not know.

Q. How are the total water, steam, power, transportation, inspection, drafting, and laboratory charges reckoned?—A. I do not know.

Q. What were the total power charges for your plant last year—by power charges is meant electric power, steam power, water power, or producer gas for running engines, as the case may be—and how did you arrive at the method of assigning the various proportions to the various operations?—A. I do not know.

Q. The same information is desired for the laboratory, drafting, inspection, and transportation charges.—A. I do not know.

Q. What is the cost per ton of class A-2 shipped plates?—A. I do not know.

Q. What is the cost per ton of class B shipped plates?—A. I do not know.

Q. What was the average cost per ton of class C steel armor?—A. We do not manufacture class C armor.

Q. What do you reckon your working capital to be?—A. I do not know.

Q. What does the maintenance of your plant amount to per annum?—A. I do not know.

Q. Is this amount over and above the repairs which have been charged to the various operations comprising the total manufacture, and separate from depreciation?—A. I do not know.

Q. What does this maintenance mean? To what is it applied?—A. I do not know.

Q. What is the total of proportional administration charges made to armor? How has this been arrived at?—A. I do not know.

Q. Give a tabulated list showing the various salaries paid, and how proportionately divided, so as to include the armor plant.—A. I do not know.

Q. How much did the insurance charges on your armor plant amount to?—A. I do not know.

Q. How much taxes are chargeable to the armor plant?—A. I do not know.

Q. How much do you charge to armor in behalf of the pension fund?—A. I do not know.

Q. How much depreciation is charged against the armor plant?—A. I do not know.

Q. What is the depreciation and how has it been arrived at?—A. I do not know.

Q. After a year's operations within which a certain sum of money has been set aside from the proceeds of the manufacture of armor for depreciation charge, what is done with this money?—A. I do not know.

Q. After depreciation charge has been made to a year's operation, and there have been no replacements of tools, is this amount used to amortize the original investment?—A. I do not know.

Q. Since the erection of your armor plate what has been the total amount of depreciation which has been charged into the cost of armor?—A. I do not know.

Q. How much, if any, of this sum of money has been actually used for the installation of new machinery in place of old, for building new buildings, furnaces, etc., in place of old, and has this expenditure been added to the capital account?—A. I do not know.

Q. The remainder of this sum of money which has not been expended, has it been used for amortizing any of the original investment?—A. I do not know.

Q. How much money is invested in your armor plant?—A I do not know.

Q. Does this represent the total amount which has been expended for this plant, inclusive of all depreciation replacements?—A. I do not know.

Q. In reckoning your profit, is it reckoned as a profit on the total amount of money which has been put into the armor plant or on the amount which has been put into the armor plant less all depreciation which has not been used for the purpose of replacement?—A. I do not know.

#### STATEMENT OF MR. JAMES J. CAMPBELL.

Mr. James J. Campbell, being duly sworn, testified as follows:

Q. The CHAIRMAN. What is your name?—A. James J. Campbell.

Q. What is your official connection with the Carnegie Steel Co.?—

A. I am the auditor and assistant secretary of the company and, as auditor, am in control of all of the company's accounting.

Q. How much does it cost your company, f. o. b., to produce a ton of K. C. armor, Class A-1? That is, material, labor, and shop overhead charges.—A. I am not permitted by the policy of our company to give out such information.

Q. How much do you add to this cost for deterioration of plant and administration?—A. As this is a detail of our costs, I can not state, for the reason given in answer to the preceding question.

Q. In calculating costs do you take the annual output of a single year or of a term of years, and do you make any allowance for rejections and ballistic failures?—A. We make monthly costs of our armor ingots produced, and at the end of each calendar year make up yearly costs of same, taking cognizance of any annual adjustments which could not be worked into the monthly costs. From ingots forward we carry the manufacturing expenses in suspense until the armor plates are finally finished, at which times (monthly) we make costs for the finished plates, which also include the costs of the ingots used in the process. We try to include in these costs all items (whether debits or credits) which properly relate thereto.

Q. What are the various components of this cost per ton?—

A. As this is a detail of costs, I can not state, for the reason already given.

Q. What is the cost per ton of the armor ingot at the forge, including all rejections?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. Give the components, with their unit prices, that enter into a furnace charge for an armor heat?—A. As this is a detail of costs, I can not state, for the reason already given.



Q. How much repair and preparation cost for the open-hearth furnace is made for each heat?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. How much does this amount to per ton of armor ingot produced?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. How much does the repair and preparation cost of the ladles amount to for each ton of ingot?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What is the fuel charge for each ton of ingot?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What is the proportional laboratory superintendence charge for each ton of ingot?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What is the lifting, stripping, and chipping charge per ton of ingot?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What is the power charge, including steam, electric, and water, for each ton of ingot?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What is the cost for forging?—A. As this is a detail of costs, I can not state for the reason already given.

Q. What scrap allowance is made for condemned ingots?—A. As this is a detail of costs, I can not state for the reason already given.

Q. How many tons of armor ingots did your company manufacture last year?—A. Eighteen thousand eight hundred and thirty-one gross tons.

Q. What was the total number of these ingots in tonnage which were rejected before reaching the forge?—A. Five hundred and twenty-four gross tons.

Q. How many tons of ingots were forged during the past year?—A. Eighteen thousand three hundred and seven gross tons.

Q. How many tons of ingots were rejected during the forging?—A. None.

Q. What scrap allowance was made for those rejected during forging?—A. None rejected.

Q. What was the oxidation and scale loss at the forge?—A. This is also a detail of costs; however, we have no accurate line on what the oxidation and scale is at this point in the process.

Q. What did the labor for forging each ton of ingot amount to?—A. As this is a detail of costs, I can not state for the reason already given.

Q. What did the fuel for each ton of ingot forged amount to?—A. As this is a detail of costs, I can not state for the reason already given.

Q. What did the repairs to heating furnaces amount to for each ton of armor?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What did the electric power, light, steam, water, drafting, transportation, and inspection per ton of plate amount to during the forging?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. Of all the ingots forged and not rejected, what percentage was discarded? That is, how many tons?—A. Four thousand seven hundred and forty-six gross tons.



Q. What allowance was made for the metal thus discarded?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What is the unit price per ton of plate when ready for carbonizing?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. How many tons of armor plate were carbonized at the works of your company last year?—A. Thirteen thousand five hundred and sixty-one gross tons.

Q. What was the oxidization and scale in this treatment in tons?—A. This is also a detail of cost. However, I would state that we have no accurate account of the oxidization and scale in this step of the process.

Q. What was the total number of plates rejected during carbonization?—A. None.

Q. What does the labor per ton of carbonized plate amount to?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What does the material per ton of carbonized plate amount to?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. How much fuel per ton of plate is used in carbonizing?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. How much did the furnace repairs per ton of carbonized plate amount to?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What does the proportional amount of steam, electric power, lighting, drafting, inspection, laboratory, and transportation amount to per ton of carbonized plate?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. How much is the carbonized plate worth per ton without machining?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. How many tons of armor plate were reformed by your company during the past year?—A. Thirteen thousand five hundred and sixty-one gross tons.

Q. How many tons of plate were rejected during the reforming process, and was any allowance for the recovered material made in working the cost of armor?—A. Two thousand one hundred and seventy gross tons. The allowance made therefor is a detail of our cost which I am not at liberty to reveal.

Q. What does the labor per ton for reforming amount to?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What do the repairs per ton for reforming amount to?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What does the fuel per ton for reforming amount to?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What is the proportional amount of power—electric, steam, water—for reforming?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What does the proportional drafting, inspection, transportation, and laboratory for reforming amount to?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. How much discard is made after reforming?—A. None.

Q. What allowance is made for this discard in reckoning the cost?—  
A. No discard made.

Q. What is the cost of armor per ton after reforging?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. How many tons of armor plate were sent to treatment by your company during the past year?—A. Eleven thousand three hundred and ninety-one gross tons.

Q. How many tons were lost during treatment by rejection?—A. One thousand one hundred and fifteen gross tons.

Q. What does the labor per ton of treated plate amount to?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What does the material per ton of treated plate amount to?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What do the repairs per ton of treated plate amount to?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What does the fuel per ton of treated plate amount to?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What do the proportional charges per ton of treated plate amount to?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What is the total cost per ton of treated and rectified plate?—  
A. As this is a detail of costs, I can not state, for the reason already given.

Q. How many tons of armor plate were sent to machining by your company last year?—A. Ten thousand two hundred and seventy-six gross tons.

Q. How many tons of machined plate were produced last year?—  
A. Six thousand two hundred and sixty-seven gross tons.

Q. Were there any rejections during the process of machining? If so, how many tons, and what allowance was made for the rejected material in reckoning the final cost?—A. Two hundred and twelve gross tons. The allowance made therefor is a detail of our cost which I am not at liberty to reveal.

Q. How much per ton does the labor of machining amount to?—  
A. As this is a detail of costs, I can not state, for the reason already given.

Q. How much does the machined scrap amount to?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. How much does the material for machining amount to, including oil, waste, repairing of tools, and supply of tools?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. How much do the repairs per ton of machined plate amount to during the machining operations?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What do the proportional charges per ton of machined plate amount to?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What is the cost per ton of machined plate produced?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. How many tons of machined plate were presented by your company for shipment last year?—A. Five thousand nine hundred and nineteen gross tons.



Q. What do the labor and material for preparation for shipment amount to per ton of finished plate?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. How are the total water, steam, power, transportation, inspection, drafting, and laboratory charges reckoned?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What were the total power charges for your plant last year—by power charges is meant electric power, steam power, water power, or producer gas for running engines, as the case may be—and how did you arrive at the method of assigning the various proportions to the various operations?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. The same information is desired for the laboratory, drafting, inspection, and transportation charges.—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What is the cost per ton of Class A-2 shipped plates?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What is the cost per ton of Class B shipped plates?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What was the average cost per ton of Class C steel armor?—A. Understanding that Class "C" covers bolts, nuts, etc., I would state that we do not manufacture this class.

Q. What do you reckon your working capital to be?—A. We do not have a segregated working capital for this department of our business; but our estimate is that it requires about \$1,200,000, operating as we have been in recent years. In this connection, it must be understood that the process for making heavy cemented armor covers a period of about eight months—from the making of the ingot to the shipping of the group; and, although the Government makes partial payments at various stages of the process, 10 per cent of the price of the last group is withheld until six months after the last plate is placed on the vessel, provided that this final 10 per cent shall not be withheld more than nine months after the shipment of the last plate.

Q. What does the maintenance of your plant amount to per annum?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. Is this amount over and above the repairs which have been charged to the various operations comprising the total manufacture, and separate from depreciation?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What does this maintenance mean? To what is it applied?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. What is the total of proportional administration charges made to armor? How has this been arrived at?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. Give a tabulated list showing the various salaries paid, and how proportionately divided, so as to include the armor plant?—A. As this is a detail of costs, I can not state, for the reason already given.

Q. How much did the insurance charges on your armor plant amount to?—A. This is also a detail of costs, but, as a matter of fact, we carry our own risks and figure a provision accordingly.



Q. How much taxes are chargeable to the armor plant?—A. This is also a detail of costs. We have to estimate the amount of taxes applicable to our armor plant because the local tax assessments are made in such a way that armor plant facilities are mixed up with other facilities at our Homestead Works.

Q. How much do you charge to armor in behalf of the pension fund and liability fund?—A. This is also a detail of costs; but we do not charge anything for pensions. We only charge a provision, based on our experience, to take care of our liability on account of accidental injuries to employees—which comprehends not only compensation for partial or total disability, but also the payment of wages to and surgical and hospital care of the injured while off duty because of accidents.

Q. How much depreciation is charged against the armor plant?—A. Under our practice we do not charge depreciation as an item of our manufacturing costs. We provide for depreciation through our general profit and loss account, and this provision is made with reference to all our plants and facilities as a whole, and not as to units or classes of equipment. Of course, when we come to estimate selling costs for any particular product we must approximate a fair rate of depreciation applicable thereto.

Q. What is this depreciation, and how has it been arrived at?—A. Having in mind the answer just made, I would state that we consider that our so-called selling costs for armor should include a charge for depreciation based on a rate of 6 per cent per annum on the cost of the plant and facilities, exclusive of cost of site, considering fully the character and risks of the business.

Q. After a year's operations, within which a certain sum of money has been set aside from the proceeds of the manufacture of armor for depreciation charge, what is done with this money?—A. As already stated, we do not set aside depreciation funds specifically on the armor plant.

Q. After depreciation charge has been made to a year's operation and there have been no replacements of tools, is this amount used to amortize the original investment?—A. Depreciation funds in a going business like ours are used to replace worn-out facilities in kind or to ultimately return to stockholders exhausted investments.

Q. Since the erection of your armor plant what has been the total amount of depreciation which has been charged into the cost of armor?—A. As already explained, we do not charge into our costs for depreciation.

Q. How much, if any, of this sum of money has been actually used for the installation of new machinery in place of old, for building new buildings, furnaces, etc., in place of old, and has this expenditure been added to the capital account?—A. I can not tell just how much has been charged off to general depreciation funds which have been provided for all property, for renewals and replacements of the armor plant. The armor plant was owned and operated, up to 1900, by the old Carnegie partnerships, i. e., Carnegie, Phipps & Co. (Ltd.), to July 1, 1892, and then by the Carnegie Steel Co. (Ltd.), whose books of account are not in our present corporation's possession. I do know, however, that none of these expenditures for renewals and replacements have been added to capital account.

Q. The remainder of this sum of money which has not been expended, has it been used for amortizing any of the original investment?—A. Any unexpended allowances made for general depreciation for all property have not, as yet, been used for amortizing any of the original investment. But we claim that good business principles and practices permit us, when estimating our selling costs, to include therein always the recognized fair rate of depreciation applicable to such plants, so long as we maintain our plant efficiently and sufficiently, without regard to any amounts which may or may not have been set aside from profits or otherwise for amortization.

Q. How much money is invested in your armor plant?—A. In the armor plant and auxiliary departments required and used for armor making, there has been invested, up to October 31, 1914, \$6,125,846.44, including a value of \$450,000 for 30 acres of land.

Q. Does this represent the total amount which has been expended for this plant, inclusive of all depreciation replacements?—A. It does not include cost of any replacements, so far as I can determine from records now available.

Q. In reckoning your profit, is it reckoned as a profit on the total amount of money which has been put into the armor plant, or on the amount which has been put into the armor plant less all depreciation which has not been used for the purpose of replacement?—A. We do not calculate our profits in this manner. Differences between selling price, proceeds, and shop or manufacturing costs are carried to credit of our general profit and loss account, and all overhead expenses and taxes and general depreciation, etc., are charged to general profit and loss.

WEDNESDAY, NOVEMBER 25, 1915.

SPECIAL COMMITTEE,  
*South Bethlehem, Pa.*

The committee met at 2.15 p. m. at the office of the Bethlehem Steel Co., Hon. B. R. Tillman (chairman) presiding.

Present: Hon. L. P. Padgett, Member of Congress, Rear Admiral J. Strauss, United States Navy, members of the committee. Lieut. Commander C. C. Bloch, United States Navy, Mr. J. B. Knight, and Mr. E. S. Theall, assistants to the committee.

There were also present Mr. E. G. Grace, president of the Bethlehem Steel Co., Mr. W. F. Roberts, general superintendent of the Lehigh plant of the Bethlehem Steel Co., Mr. F. A. Shick, comptroller and auditor of the Bethlehem Steel Co.

The CHAIRMAN. The committee prepared before we left Washington, considering all the phases of the manufacture of armor and in pursuance of instructions in the law, a list of questions which Admiral Strauss will propound to you as he did to Mr. Dinkey, president of the Carnegie Steel Co.

#### STATEMENT OF MR. E. G. GRACE, PRESIDENT OF THE BETHLEHEM STEEL CO.

Mr. E. G. Grace, having been duly sworn, testified as follows:

The CHAIRMAN. What is your name, and what connection do you have with this company?

Mr. GRACE. E. G. Grace, president of the company.



The CHAIRMAN. President of the Bethlehem Steel Co.?

Mr. GRACE. Yes, sir; president of the Bethlehem Steel Co.

Q. How much does it cost your company to produce a ton of K. C. armor, f. o. b., Class A-1 armor, including material, labor, and shop overhead charges?—A. We would prefer not to answer. We consider the cost of armor as confidential information, and the character of information which we would not want to make available for our competitors. We believe that we have developed processes in our method of manufacturing armor which are unique and unusual, and not known to our competitors. Such conditions are naturally reflected in costs, and are the development of our many years of experience in the manufacture of armor, and constitute a very valuable asset as stock in trade. We understand the object of your investigation to be to obtain information relative to armor-plate plant and armor-plate manufacture, to the end of the possible building and operating of an armor-plate plant by the United States Government. In the event of this coming to pass, we would look upon the United States Government as a more serious competitor than the ordinary competitor, on account of its position of controlling the purchases of armor. We must also bear in mind that we are at all times subject to foreign competition, operating under widely different conditions than confront us in this country. Unquestionably, information of the character requested in the above question would place our present and possible future competitors in a position of decided advantage over us.

Q. Has this cost been reached by taking the annual output of a single year, or of a term of years, and making allowance for rejections and ballistic failures?—A. Same as to first question.

Q. What are the various components of this cost per ton?—A. Same as to first question.

Q. What is the cost per ton of the armor ingot at the forge, including all rejections?—A. Same as to first question.

Q. Give the components, with their unit prices, that enter into a furnace charge for an armor heat.—A. Same as to first question.

Q. How much repair and preparation cost for the open-hearth furnace is made for each heat?—A. Same as to first question.

Q. How much does this amount to per ton of armor ingot produced?—A. Same as to first question.

Q. How much does the repair and preparation cost of the ladles amount to for each ton of ingot?—A. Same as to first question.

Q. What is the fuel charge for each ton of ingot?—A. Same as to first question.

Q. What is the proportional laboratory, superintendence charge for each ton of ingot?—A. Same as to first question.

Q. What is the lifting, stripping, and chipping charge per ton of ingot?—A. Same as to first question.

Q. What is the power charge, including steam, electric, and water, for each ton of ingot?—A. Same as to first question.

Q. What is the cost for forging?—A. Same as to first question.

Q. What scrap allowance is made for condemned ingots?—A. Same as to first question.

Q. How many tons of armor ingots did your company manufacture last year?—A. Eighteen thousand and ninety-four and thirty-seven one-hundredths tons.



Q. What was the total number of these ingots in tonnage which were rejected before reaching the forge? What was the total number of tons rejected before coming to the forge?—A. Same as first question.

Q. How many tons of ingots were forged during the past year?—A. Eighteen thousand and fourteen and forty-five one-hundredths.

Q. How many tons were rejected during the forging?—A. Same as to first question.

Q. What scrap allowance was made for these rejected during forging?—A. Same as to first question.

Q. What was the oxidization and scale loss at the forge?—A. Same as to first question.

Q. What did the labor for forging each ton of ingot amount to?—A. Same as to first question.

Q. What did the fuel for each ton of ingot forged amount to?—A. Same as to first question.

Q. What did the repairs to heating furnaces amount to for each ton of armor?—A. Same as to first question.

Q. What did the electric power, light, steam, water, drafting, transportation, and inspection per ton of plate amount to during the forging?—A. Same as answer to first question.

Q. Of all the ingots forged and not rejected, what percentage was discarded—how many tons?—A. We will attempt to give you on the approximate yield of finished plate from the ingot. I think that is the way we can get it.

The CHAIRMAN. You mean the percentage of armor plate shipped and delivered to the Government, or delivered to the Government and the material you started out with?

Mr. GRACE. This phrase would cover it with us: The percentage of yield of shippable material in our armor-plate practice. We would be glad to give you the average of that. It varies considerably.

The CHAIRMAN. Will you give us the total you start with?

Mr. GRACE. We will give you the yield of good armor plate from the ingot.

The CHAIRMAN. Will you give us the weight of the ingot you start with?

Mr. GRACE. Yes; the weight of the ingot. I will give you the percentage of yield of good armor plates from those ingots. For instance, if we had 8,000 tons of ingots cast last year, I will give you the percentage of shippable armor, approximately, out of those ingots—40, 42, or 43 per cent, whatever it may be. [Later.] Our yield of shippable armor for 1913 was about 41 per cent.

Admiral STRAUSS. What allowance is made for the metal thus discarded?

A. Same as to first question.

Q. What is the unit price per ton of plate when ready for carbonizing?—A. Same as to first question.

Q. How many tons of armor plate were carbonized at the works of your company last year?—A. Twelve thousand four hundred and thirty-four and seventy-one-hundredths tons.

Q. What was the oxidization and scale in this treatment, in tons?—A. Same as to first question.

Q. What was the total number of plates rejected during carbonization?—A. Same as to first question.

Q. What does the labor per ton of carbonized plate amount to?—

A. Same as to first question.

Q. What does the material per ton of carbonized plate amount to?—

A. Same as to first question.

Q. How much fuel per ton of plate is used in carbonizing?—A. Same as to first question.

Q. How much did the furnace repairs per ton of carbonized plate amount to?—A. Same as to first question.

Q. What does the proportional amount of steam, electric power, lighting, drafting, inspection, laboratory, transportation, amount to per ton of carbonized plate?—A. Same as to first question.

Q. How much is the carbonized plate worth per ton, without machining?—A. Same as to first question.

Q. How many tons of armor plate were reformed by your company during the past year?—A. Nine thousand seven hundred and sixty-five and four one-hundredths tons.

Q. How many tons of plate were rejected during the reforming process, and was any allowance for the recovered material made in working the cost of armor?—A. Same as to first question.

Q. What does the labor per ton for reforming amount to?—A. Same as to first question.

Q. What do the repairs per ton for reforming amount to?—A. Same as to first question.

Q. What does the fuel per ton for reforming amount to?—A. Same as to first question.

Q. What is the proportional amount of power—electric, steam, water—for reforming?—A. Same as to first question.

Q. What does the proportional drafting, inspection, transportation, and laboratory for reforming amount to?—A. Same as to first question.

Q. How much discard is made after reforming?—A. About 25 to 30 per cent.

Q. What allowance is made for this discard in reckoning the cost?—A. Same as to first question.

Q. What is the cost of armor per ton after reforming?—A. Same as to first question.

Q. How many tons of armor plate were sent to treatment by your company during the past year?—A. You mean by that all kinds of treatment?

Admiral STRAUSS. Treatments of armor; that would not include you first treatment of the ingot.

A. Twelve thousand four hundred and thirty-four and seventy-one hundredths tons.

Q. How many tons were lost during treatment by rejection?—A. Same as to first question.

Q. What does the labor per ton of treated plate amount to?—A. Same as to first question.

Q. What does the material per ton of treated plate amount to?—A. Same as to first question.

Q. What do the repairs per ton of treated plate amount to?—A. Same as to first question.

Q. What do the proportional charges per ton of treated plate amount to?—A. Same as to first question.



Q. What is the total cost per ton of treated and rectified plate?—

A. Same as to first question.

Q. How many tons of armor plate were sent to machining by your company last year?—A. Same as to first question.

Q. How many tons of machined plate were produced last year?—

A. Seven thousand two hundred and sixty-nine and twenty-two hundredths tons.

Q. Were there any rejections during the process of machining? If so, how many tons and what allowance was made for the rejected material in reckoning the final cost?—A. Same as to first question.

Q. How much per ton does the labor of machining amount to?—

A. Same as to first question.

Q. How much does the machined scrap amount to?—A. The cost of the machined scrap, or the weight?

Admiral STRAUSS. The weight.

A. Same as to first question.

Q. How much does the material for machining amount to, including oil, waste, repairing of tools, supply of tools?—A. Same as to first question.

Q. How much do the repairs per ton of machined plate amount to during the machining operation?—A. Same as to first question.

Q. What do the proportional charges per ton of machined plate amount to?—A. Same as to first question.

Q. What is the cost per ton of machined plate produced, ready for shipping, but not f. o. b. and jacked up?—A. Same as to first question.

Q. How many tons of machined plate were presented by your company for shipment last year?—A. Seven thousand two hundred and seventy-seven and twenty-nine one-hundredths tons.

Q. What do the labor and material for preparation for shipment amount to per ton of finished plate?—A. Same as to first question.

Q. How are the total water, steam, power, transportation, inspection, drafting, and laboratory charges reckoned?—A. We will supply that as to method. [Later.] The cost of each of these items is kept as to total, and is distributed to cost of armor plate on the basis of service rendered.

Q. What were the total power charges for your plant last year? By power charges is meant electric power, steam power, water power, or producer gas for running engines, as the case may be. And how did you arrive at the method of assigning the various proportions to the various operations?—A. Same as to first question.

Q. The same information is desired for the laboratory, drafting, inspection, and transportation charges.—A. Same as to first question.

Q. What is the cost per ton of class A-2 shipped plate?—A. Same as to first question.

Q. What is the cost per ton of class B shipped plate?—A. Same as to first question.

Q. What is the average cost per ton of class C steel armor?—A. Same as to first question.

Q. What do you reckon your working capital to be?—A. We have no definite working capital against any one of our particular products, but would estimate the amount of working capital required for the manufacture of armor, to be \$500,000, including its inventories.



Q. What does the maintenance of your plant amount to per annum; that is, the armor plant and all that belongs to the production of armor?—A. Same as to first question.

Q. Is this amount over and above the repairs which have been charged to the various operations comprising the total manufacture and separate from depreciation?—A. Same as to first question.

Q. What is the total of proportional administration charges made to armor; how has this been arrived at?—A. We make no division.

Q. Give a tabulated list showing the various salaries paid, and how proportionally divided, so as to include the armor plant.—A. We haven't such a thing.

Q. How much did the insurance charges on the armor plant amount to?—A. We make no attempt to distribute them.

Mr. PADGETT. Referring to the question before the last, with reference to the statement of salaries paid to those engaged in the manufacture of armor. You say you have no list?

Mr. GRACE. I must have misunderstood the question. We have no division of the salaries as against armor.

Admiral STRAUSS. The question was, "Give a tabulated list showing the various salaries paid, and how proportionally divided, so as to include the armor plant."

Mr. GRACE. We would want to say "no" to that.

Mr. PADGETT. That was the reason I asked the question, because it occurred to me that it could be taken both ways.

Q. How much taxes are chargeable to the armor plant?—A. We make no division of that.

Q. How much do you charge to armor in behalf of the pension fund and liability fund?—A. No direct charge against any of the products of the works.

Mr. PADGETT. I would like to ask a question right there. In fixing the selling price of armor do you put that in as one of the elements of cost?

Mr. GRACE. We would put it in; yes.

Mr. PADGETT. Would you state what you put in for that?

Mr. GRACE. No; we would not want to tell that, because it is a part of the cost of armor.

Mr. PADGETT. Yes; I understand.

Mr. GRACE. In an estimated way.

Mr. PADGETT. You mean you do not keep it in your books, but you put it in as one of the component elements in fixing the price?

Mr. GRACE. In arriving at the selling price, naturally, just the same as we would do on any other of our products. We reflect in our own way an estimated amount for the overhead of that particular product. We would not want to give that information on armor.

Q. How much depreciation is charged against the armor plant?—A. None, direct.

Mr. PADGETT. Just on that point. In fixing the selling price you put that in as one of the elements—the depreciation of your plant—in fixing the selling price?

Mr. GRACE. We reflect in our price an estimated amount, or our own idea of the amount, overhead charges, local taxes, insurance, and all those things which are not carried directly against any one product, but which we use our own judgment in distributing.

Mr. PADGETT. And you do distribute them in fixing the price?

Mr. GRACE. In our mind we have a certain idea of what that would be but it does not show in our books anywhere.

Mr. PADGETT. Now, as to what that proportional part is, you decline to answer?

Mr. GRACE. Yes; I would not want to say.

Q. After a year's operations within which a certain sum of money has been set aside from the proceeds of the manufacture of armor for depreciation charge, what is done with this money?—A. There is really no money set aside. It is a matter of a book entry.

Mr. PADGETT. What do you do with that book entry to counter-balance?

Mr. GRACE. I will refer that question to the auditor.

Q. After depreciation charge has been made to a year's operation, and there have been no replacements of tools, is this amount used to amortize the original investment?—A. We will endeavor to give our method of handling our overhead and depreciation charges when we get your direct questions. I think that will make it simpler for you because we have no objection to explaining our method of handling our accounts. [Later.] Our general administrative and selling expenses are charged monthly to our general profit-and-loss account and are not distributed against any individual products. The matter of depreciation is decided at the end of our fiscal year, and a lump sum is set aside to cover depreciation and obsolescence on our entire properties.

Q. Since the erection of your armor plant, what has been the total amount of depreciation which has been charged into the cost of armor?—A. That, of course, we do not have. We have never distributed that way.

The CHAIRMAN. What have you spent for repairs to your plant for manufacturing armor since I was here?

Mr. GRACE. That I would not know.

The CHAIRMAN. You pointed out where you had rebuilt entirely a good part of it.

Mr. GRACE. Yes; but there are certain items which you would call repairs and extensions to plant which were not legitimate repairs.

The CHAIRMAN. Would you mind supplying the Government an estimate of an up-to-date armor plant?

Mr. GRACE. I would not want to do that; but I would be entirely willing to state in a general way what I think an armor plant could be built for, for the United States.

The CHAIRMAN. Will you state that now?

Mr. GRACE. I think \$1,000,000 for 1,000 tons of output. My judgment would be that a 10,000-ton plant would cost approximately \$10,000,000.

The CHAIRMAN. And would that mean that a 20,000-ton plant would cost \$20,000,000?

Mr. GRACE. No. That is the reason I stated cost for a plant of 10,000 tons capacity as a basis, for in creating a larger plant there would be many items which would not have to be duplicated for the increased capacity.

Admiral STRAUSS. What is the capacity of your plant?

Mr. GRACE. From 10,000 to 12,000 tons a year, on the present character of armor.



Admiral STRAUSS. How much money do you estimate, if you care to answer that question, that you have invested in your plant exclusive of the site?

Mr. GRACE. In the neighborhood of \$7,100,000.

Admiral STRAUSS. Why, then, would it cost the Government \$12,000,000 to duplicate your plant?

Mr. GRACE. To begin with, our plant is built at cost; there is no profit in it. Our plant has been, in the main, created by ourselves and built at our cost, which you could not duplicate in a contracting proposition. If our plant has cost us over \$7,000,000, you would not have to add much of a contractor's profit, which they would insist on having from the Government, to bring it up to \$10,000,000 or \$12,000,000.

The CHAIRMAN. Would you mind indicating whereabouts in the United States you think would be the best place for the Government to construct a plant?

Mr. GRACE. Bethlehem.

The CHAIRMAN. You want your rival right at home?

Mr. GRACE. We want him where we can watch him.

The CHAIRMAN. Would you mind stating why?

Mr. GRACE. Good labor conditions, and the Bethlehem Steel Co. would furnish you your pig iron very cheaply.

The CHAIRMAN. In other words, you want a customer as well as a competitor?

Mr. GRACE. We want a customer as well as a competitor. Speaking seriously, now, we believe that this territory—Bethlehem, Philadelphia—is very well located for a steel industry, and your shipyards are primarily on the eastern coast, where the armor will be consumed.

Mr. PADGETT. You speak of this section; do you include Philadelphia in the Bethlehem region?

Mr. GRACE. Yes. If you ask me personally, I should say Bethlehem, but Philadelphia is a good location for any geographical reasons that one could give. I think, maybe, our labor conditions are possibly better than at Philadelphia, but outside of Philadelphia you get possibly as good labor conditions as you get here. I certainly think you want your armor plant, if you build one, in the East, where you can assemble your raw materials cheaply and where you will have your shipyards, your consumers, near at hand.

The CHAIRMAN. Would you mind telling the committee what salaries these gentlemen in here are receiving, including yourself?

Mr. GRACE. I would not want to tell you that.

The CHAIRMAN. Would you mind telling the committee what your foremen of the shops receive?

Mr. GRACE. I would not want to give you that information because it has a direct bearing on labor conditions and on resulting costs; and it would be a difficult matter for me to supply it in any event, for the reason that our men are paid a nominal salary and participate in the profits. Every man you are talking to here has a certain salary and participation in the profits of the company, so your salary list would not be representative.

The CHAIRMAN. How many graduates of the Naval Academy or ex-naval officers have you in your employ?



Mr. GRACE. We will be glad to supply that, and I hope to get some more. [Later.] We have 11 United States naval graduates and ex-officers in our employ.

The CHAIRMAN. All that I have ever seen are very fine gentlemen.

Mr. GRACE. They are very fine gentlemen. I will also supply you the number from West Point, if you like. [Later.] We have one United States Army graduate and three ex-officers in our employ.

Q. How much money is invested in your armor plant?—A. Approximately \$7,100,000.

The CHAIRMAN. And you think you have a fine one?

Mr. GRACE. We have a pretty good plant; it needs some improvements to it. I pointed out to you when we went through the shops where we have to make a large expenditure to increase our bending facilities. We are not ashamed of our plant as compared with our competitors, nor of its product, either.

The CHAIRMAN. You are not boasting, you are just conscious of your own worth and do not mind claiming it?

Mr. GRACE. I will take every opportunity to advertise it.

Q. Does that sum include the cost of the land?—A. No.

Q. Does this represent the total amount which has been expended for this plant, inclusive of all depreciation replacements?—A. We have no absolute book records of the total investment in armor-plate plant. First, because many of our records showing the detail cost of various items were destroyed in the office fire in 1906; and second, because in a plant like ours, where an armor plate plant is one of the departments served by auxiliary departments, such as transportation, electric stations, and the like it is necessary to divide on our best possible judgment and distribute on our best possible judgment the investment in such auxiliary departments. With the reserves that the statement is based on our best possible judgment we consider the investment in our armor plate plant (exclusive of working capital and inventories) to be \$7,128,705, which represents the value only of land, buildings, machinery, and equipment which are now actually in the plant and in operation and does not include the value of any machinery or equipment which has been scrapped or dismantled.

Q. In reckoning your profit, is it reckoned as a profit on the total amount of money which has been put into the armor plant or on the amount which has been put into the armor plant less all depreciation which has not been used for the purpose of replacement?—A. No, we make no division of our total profits.

The CHAIRMAN. Have you ever figured out the relative expense connected with the armor factory and the general plant?

Mr. GRACE. We have estimated what the value of our armor plant is, in figuring the price of armor—what we should get as being the right price for it. We have made our own estimate in arriving at the price which we asked for armor, but in our accounting we do not have such a thing, because we have a general expense for all the parts of the company.

Q. How many acres are now occupied by your plant?—A. Find it impossible to give accurate answer to this question on account of our auxiliary departments serving generally other departments as well as the armor-plate department.

Mr. PADGETT. Just a moment, please, before we get away from that. In 1906 the figures furnished by the Bethlehem Steel Co. to the committee that was investigating the matter was \$5,625,000 for armor plant alone. That appears in House Document No. 193, Fifty-ninth Congress, second session, on page 30. And I was going to ask you to state, when you made your answer, the items that you have added since 1906 to run it up to \$7,100,000.

Mr. GRACE. In other words, we will see if we can connect this statement with our present situation. That is what you want. We will see if we can coincide those two dates. Whether we can or not I am not sure, but I think we can. But whatever we supply will be, from the best of our knowledge, correct as shown on our books to-day. We will give you from our records the amount of money which we have at this date invested in the armor-plate plant. That, after all, seems to me is what you want, and that would be better even than mere hearsay of this character.

Admiral STRAUSS. I would just like to go back to that question—I do not know whether Mr. Grace said he would tell us or not—and that is, how he arrives at the cost; what method he employs in arriving at a proper selling price for the armor.

Mr. GRACE. I could only cover that in a broad statement of this kind, that we estimate our costs, including what we would consider in our judgment belongs to the armor-plate department. We would arrive at an estimated cost of output upon which we would base our judgment for selling price, but that would absolutely have to be an estimation.

The CHAIRMAN. What percentage of your business is the manufacture of armor?

Mr. GRACE. Well, Senator, that varies so much with the amount of work which is given to us by the Navy Department. For instance, the last two or three years we have had armor-plate contracts amounting to 2,500 or 2,600 tons of armor a year. We have had 5,000-ton contracts; we have had 8,000-ton contracts. So it varies absolutely with each year.

The CHAIRMAN. Well, what I was arriving at was this: What dividend did the company pay?

Mr. GRACE. There is no objection to stating that. We are paying 5 per cent on the preferred stock.

The CHAIRMAN. What is the capital stock?

Mr. GRACE. Thirty millions—fifteen millions preferred and fifteen millions common stock. From 1907 to 1912, inclusive, we paid no dividends. In 1913 and 1914 we paid 5 per cent on the preferred stock. We have never paid any dividend on the common.

The CHAIRMAN. What did you say the capital was?

Mr. GRACE. Thirty million—fifteen million preferred and fifteen million common.

Mr. PADGETT. You stated that last year the price of armor was \$440 a ton, I believe?

Mr. GRACE. That was our contract for the last year's armor—for the base, class A-1 armor.

Mr. PADGETT. This year the contract is \$425, isn't it?



Mr. GRACE. That is the contract price for that same class of armor.

Mr. PADGETT. Now, last year you had a contract for about how many tons of armor?

Mr. GRACE. Twenty-six hundred tons from the United States Government.

Mr. PADGETT. Now, this year you have a contract for how much?

Mr. GRACE. For 16,000 tons.

Mr. PADGETT. A little over 16,000 tons?

Mr. GRACE. Between 16,000 and 17,000.

The CHAIRMAN. If your capacity is only 12,000 tons you will have to get some help to make 16,000 tons.

Mr. GRACE. To meet the conditions of delivery required by the specifications we will have to get help.

Mr. PADGETT. I will ask you if the reduction of \$15 per ton is a sufficient reduction and a reasonable reduction in the price, considering that last year you had 2,500 tons and this year you have got 16,000 tons, or more than enough to run at your full capacity; and I ask that in view of the statement that was made by Mr. Schwab in 1897 when he said: "I am prepared to say that if you will give us 3,000 tons of armor per year, as estimated, we will give you a rebate of \$50 per ton for every ton over that quantity. If you will give us 3,500 tons of armor per year we will give you a rebate of \$100 per ton for every ton over that quantity." That is what Mr. Schwab stated. Now, do you think that \$15 was a fair and a reasonable reduction or rebate on the quantity between 2,500 tons awarded under the contract last year and 16,000 tons this year?

Mr. GRACE. Irrespective of Mr. Schwab's comments there, which I understand are not put in your direct question to me——

Mr. PADGETT (interposing). I am putting it as a basis.

Mr. GRACE. Of course, I would not comment on Mr. Schwab's statement. Conditions were very different. He was speaking for the Carnegie Steel Co. and not the Bethlehem Steel Co., but if you want me to answer your question whether or not \$15 represented a proper reduction on account of tonnage between the price of 1913 and the price of 1914, and that is the real question from your standpoint, I will do so. As conditions are to-day, Mr. Padgett, I could not comment on Mr. Schwab's statement because I do not know his conditions. He was talking for the Carnegie Steel Co., then.

Mr. PADGETT. What I am trying to get at is this: If for 3,500 tons he would reduce it \$100 a ton over that amount, when you run from 2,500 tons up to 16,000 tons, can not the Bethlehem Co. reasonably afford to reduce it more than \$15 a ton?

Mr. GRACE. If you will ask me the question I am ready to answer it from our standpoint as to comparative prices, but I could not, naturally, connect it with that statement of which I know nothing.

Mr. PADGETT. I will put the question in this way: Leaving out the statement of Mr. Schwab, and saying that if you had a contract last year for 2,500 tons at \$440 per ton, and this year you are given 16,000 tons, bearing in mind that one is a small quantity and the other is a very large quantity, could you not afford to make a reduction of more than \$15 per ton?

Mr. GRACE. Not below the price of \$440, because \$440 was not a sufficient price for 2,500 or 2,600 tons of armor.



Mr. PADGETT. Mr. Schwab was then getting \$500 or \$600 per ton?

Mr. GRACE. I imagine he was.

Mr. PADGETT. The price was \$500, I believe?

Lieut. Commander BLOCH. In 1896 it was \$550; in 1898 it was \$400.

Mr. GRACE. Mr. Padgett, you are going on the assumption that \$440 was a proper and a fair price for a small tonnage of armor. This company can not make 2,500 tons of armor a year for \$440 a ton without losing money. I am willing to state that.

Mr. PADGETT. You mean that it costs \$440 a ton to make armor?

Mr. GRACE. Our company with its investment to-day in its armor-plate plant could not take and run our plant at \$440 a ton and make money. We would lose money if we did.

Mr. PADGETT. With your other business?

Mr. GRACE. I am talking about the armor.

Mr. PADGETT. But if you had some foreign business?

Mr. GRACE. The United States is our only sure customer. What we have been able to get in the foreign trade has only been within a couple of years, and that has been a fortune of war.

The CHAIRMAN. Did you say that you could not afford to make armor at \$440 a ton?

Mr. GRACE. No; I did not mean that. We can not make 2,500 tons of armor with our present armor plate capacity and make any return on our plant as profit; we would show a loss on the basis of \$440 a ton.

The CHAIRMAN. Your capacity is about 12,000 ton?

Mr. GRACE. But we only got an order for 2,500 tons from the United States Government last year.

The CHAIRMAN. Whose fault was it that you got no more last year?

Mr. GRACE. We could not get it. The Secretary wouldn't give it to us, I suppose.

I am just showing that we can not make a reduction along the lines of Mr. Padgett's suggestion because \$440 is not the proper basis to start with; it is not correct; it is not a proper selling price for this tonnage of armor.

Admiral STRAUSS. Would you consider the orders of the United States Government, as supplemented by the Army and foreign Governments, as being a sufficient basis to reckon your selling price of armor, and would you consider that in fixing your selling price?

Mr. GRACE. It would add nothing tangible to add our foreign business.

The CHAIRMAN. Suppose you had a contract for 12,000 or 15,000 tons a year.

Mr. GRACE. We are willing to talk that any time. Then we would have assurance of continuous operations, and could plan accordingly.

The CHAIRMAN. Give us a basis for the talk.

Mr. GRACE. If there is any committee created or given power by Congress to negotiate with the Bethlehem Steel Co. to fill its plant for armor for the next 10 years, we will talk and talk definitely.

The CHAIRMAN. And you will see that the Government does not build its own plant?

Mr. GRACE. We will be entirely willing to make prices lower for a capacity of 10 years in our plant than we can afford to make to-day. There would be no use of my saying so if it wasn't true.

The CHAIRMAN. How much lower?

Mr. GRACE. I would have to figure.

The CHAIRMAN. Will you figure on it and answer later?

Mr. GRACE. If we are put in touch with the proper authorities, with the understanding that they will make such a negotiation, yes, we would be glad to go into it. If the United States Government would come to us as a customer and will give us a contract for 100,000 tons of armor, to be delivered in the next 10 years, we will give you better prices and be very glad to negotiate it.

Admiral STRAUSS. And would the price under those conditions be substantially lower than the present price?

Mr. GRACE. Yes; it would be, because we would have an assured business.

The CHAIRMAN. Are you willing to state to the committee how much?

Mr. GRACE. I would not.

The CHAIRMAN. After you figure?

Mr. GRACE. No; unless the power is invested in some one to conduct such negotiations, and conclude contract if satisfactory basis can be reached. That would be like sending the president of a company to negotiate with an office boy who could not close the transaction whether he wanted to or not. But if you will empower the Chief of the Bureau of Ordnance, if the Secretary of the Navy will give him that power, we will then see if we can not close a contract with him on a satisfactory basis. The Secretary doesn't have to close if he doesn't get a satisfactory price, but you have Congress empower the Secretary of the Navy to contract with the Bethlehem Steel Co. for 100,000 tons of armor, to be delivered in 10 years, and we would be glad to negotiate with the Secretary of the Navy to see if we can not satisfy him on price. We manifestly could afford to make armor at a less figure under those conditions. That is assured business; it isn't a gamble like it is to-day. This is the first real armor-plate order we have had for some time, the one we are getting this year. We have the same conditions in our gun manufacture, where we have installed this big plant which we have had no work for; Congress hasn't appropriated for it, and the Government has its own big gun shops. We are in the same identical position with reference to our gun plant, and we have sought other fields, and we have been, in a measure, successful. This year is the first year we have gotten a really sizeable order in either guns or armor from the Navy Department for some time.

Mr. PADGETT. Are there any other questions?

The CHAIRMAN. Mr. Grace, have you ever read up on the records of the company the origin of the manufacture of armor at Bethlehem?

Mr. GRACE. Yes; I am familiar with it in a general way. Naturally, I would be expected to be.

The CHAIRMAN. When was that first contract?

Mr. GRACE. We started manufacturing armor in 1891. That was when we made our first armor. And we have made an average of about 4,500 tons of armor a year for the period of 22 years. That includes everything we have made.

The CHAIRMAN. Do you know the amount of the first contract?

Mr. GRACE. No; I do not remember. If it is of interest to you we can give it to you.



The CHAIRMAN. It is of interest. I am under the impression—I could prove it if I had the documents—that for the first contract with Bethlehem the price agreed on included the estimated cost of the improvements to your works—that is, to your works here—as a general ironworks in order to make armor at all.

Mr. GRACE. Well, I do not know enough about it for that.

The CHAIRMAN. There was no place in the United States that could make armor at all—that was equipped to make it. The Secretary of the Navy, in looking around, picked out Bethlehem as the most likely company to engage in the making of armor, and after talking it over the Secretary induced the superintendent or the manager at that time to enter upon the construction or the manufacture of armor plate, and they agreed on a price. The price included the cost of the betterments to your plant that were necessary to enable them to make armor.

Mr. GRACE. I could not say yes or no to that.

The CHAIRMAN. Are there any records that will show it?

Mr. GRACE. No; because the records of our company were destroyed in 1906, except just a few of our records. But you take our situation and history to-day and that would be impossible; that is, the investment which I know of personally and the extensions made to our plant could not have been reflected in our selling price of armor. You take the selling price, just for quick figuring, at \$400 a ton of armor. One year we have been getting no armor, but last year we got 2,500 tons. This, at \$400, just for multiplying quickly, would be \$1,000,000. The total value of the contract selling price would be about 15 per cent on our investment of \$7,000,000; nothing for depreciation or anything else, if it were all profit.

The CHAIRMAN. Well, as the records were burned, it isn't worth while to talk about it.

Mr. GRACE. It seems to me that you would have it in your own files in Washington if such an understanding existed. Your department in Washington would have it. Your correspondence in the Navy Department would show it. I know that at one particular time we were asked to double our capacity of plant. That is in more recent years and was during Mr. Roosevelt's presidency, at the time when he started on his new naval program. We were practically commanded, or requested, to double the capacity of the plant at that time.

The CHAIRMAN. Digging down in my memory for some other ancient history, I recall very distinctly that the Carnegie Co. were induced by a subsequent Secretary, or the next Secretary of the Navy, to enter into the manufacture of armor plate, too, because the Government felt that it would be better to have two competing companies than to be subject to the exactions of one; there was a monopoly. Therefore, contracts were given to Mr. Carnegie—the Carnegie Steel Works—for armor.

Mr. GRACE. Yes; Bethlehem was in before Carnegie started.

The CHAIRMAN. And then, instead of competition, we believe (and when I say "we," I mean, of course, the Government) there was combination. And that combination held the Government up and exacted whatever price it saw fit until the Midvale Steel Co. came forward and made its bids, which were very much lower than either Carnegie's or Bethlehem's.



Mr. GRACE. And then they raised their price.

The CHAIRMAN. Bless God, all three of you have combined now.

Mr. GRACE. They raised their price because experience showed to them, after they got into the business, that they could not afford to sell at the price they started at; no question about that. We have no agreements with Carnegie or Midvale to maintain the price of armor, or we wouldn't sign the affidavit that we sign with every contract.

The CHAIRMAN. You have no understanding, implied or expressed, verbal or written?

Mr. GRACE. We have no agreement with anybody as to the price of armor; it is nobody's business except the Bethlehem Steel Co.'s. We have nobody to answer to or for. No question about that. You remember as well as I do that at one time, after an investigation, Congress legislated for the price of armor, which they considered fair and satisfactory.

The CHAIRMAN. And that was \$400 a ton, in 1898?

Mr. GRACE. I think that \$420 was the price finally placed. That price maintained for some years. It was the policy of the Navy Department to divide the armor among established concerns. Congress had legislated this price and we automatically quoted the price that Congress legislated. We kept on that way and we got one-third of the armor. Of course, it was the policy of the Navy Department to keep occupied all three investments which they had caused to be made. I believe that is right and proper and I think we should do it to-day. I do not think they have any business putting Bethlehem or Carnegie or Midvale out of business. I do not think that is the right policy for national preservation. If the Government is not satisfied that it is getting a correct and proper price for armor, it seems to me the logical thing for it to do is to investigate the industry, which you are doing.

The CHAIRMAN. Yet we can not get at the bottom facts.

Mr. GRACE. Yes; you have your experts.

The CHAIRMAN. Would you be willing to allow an expert from the Navy Department go through your books?

Mr. GRACE. No; certainly not.

The CHAIRMAN. How are we going to get at the facts if you refuse to tell us?

Mr. GRACE. Just like we would estimate to go into a new industry. In the last few years we have gone into the projectile business, and we made estimates. Your people have made estimates. Admiral Strauss, I presume, has made estimates (I know his predecessors have) of the cost of a plant. You have full reports on that.

The CHAIRMAN. Everyone of them varies.

Mr. GRACE. Not widely. All the way back to Admiral Niles, up to the estimate of Admiral Twining, they are very close, just as near as anybody has come—just as near as our own returns will be. They are not the same. You take the armor which was made by certain manufacturers on this year's contracts, the *Arizona*, that we are making now. I presume the cost of that armor, as compared with the armor for the Pennsylvania, was at least \$50, if not \$100, a ton higher. I am not stating that as knowledge, but as estimation, as belief.

The CHAIRMAN. As an experienced manufacturer, you would not say that if the Government built its own factory it would get armor cheaper?

Mr. GRACE. No, sir; I do not; nor as good.

The CHAIRMAN. Admiral, that seems to be a reflection on the Bureau of Ordnance, that they can not manufacture as good armor as these private establishments.

Mr. GRACE. It would be a reflection on us, Senator, if, after 15 or 20 years we could not make it better than a new establishment just starting in. The United States gets the best armor that is made in the world to-day. I am satisfied about that. And they are getting the best shells. We know because we have been in competition with the foreign manufacturers' products on the other side. We have shot our shells and we have shot at our armor, and we know. No, Senator, it is a serious problem with us. We have got to get armor; if its only a thousand tons we had better take it at the best price we can get because we get that much return on our investment. It might not be ample, but that investment, that equipment, isn't available for anything else. We can not go out and apply that to commercial manufacture; we depend on the United States Government for our customer; it must be one class of product and nothing else; we can not make engines or guns in the armor plant; it is for armor plate and nothing else. If the United States erects an armor plant we might just as well go out of the business, so far as the United States Government goes.

The CHAIRMAN. If you see the consequences to the private manufacturer of armor if the Government does go into the business of manufacturing its own armor, it would seem to me that you people who make the armor ought to get together and determine just what you will do, and let us know.

Mr. GRACE. Let the United States Government do as some of the foreign Governments do—make a contract for armor plate that calls for a tonnage, like the English, like the German. The English plants are assured for years ahead full-capacity production, and the English Government paying in the face of that \$50 or \$75 more a ton than the United States is paying, and these plants have been running full for years. That should have some bearing on the whole situation, it seems to me.

The CHAIRMAN. We can not get you to open up your books and let us see what that armor costs.

Mr. GRACE. No; I have stated my reasons for that. I do not think we ought to be called upon to do that. We have been investigated, and I think that Admiral Strauss' department has a very close idea of what it costs to make armor. I should expect that they had. I have seen some reports published that would indicate that whoever made them up got information somewhere. I believe we make armor cheaper than anybody on account of our conditions on some things.

The CHAIRMAN. Cheaper than Midvale or Carnegie?

Mr. GRACE. I think we make armor cheaper than either Midvale or Carnegie. I do not know; that may be because I am so proud of our own establishment here and think that we are better than they are; but there are a number of reasons why we should make armor cheaper than they.



The CHAIRMAN. Would you mind stating some of them?

Mr. GRACE. We control our own power. Our power must be cheaper than theirs. We have cheaper labor than either of them. I think we have a better plant than either of them.

Admiral STRAUSS. Carnegie has its own power, its own natural gas?

Mr. GRACE. But I think likely they pay more per unit for their power than we do, and they use some bituminous coal in their armor plant. We get all our power from the waste gases; that is, the driving power, not the heating power in the armor factory. The electric power and steam power for driving plant I presume is cheaper than Carnegie's or Midvale's. Then Midvale again would be handicapped in cost as against raw material. We do not have that same advantage over Carnegie, but we do have it over Midvale.

The CHAIRMAN. What is the capacity of the Midvale Steel Co.'s works?

Mr. GRACE. In armor? I do not know.

The CHAIRMAN. What is the capacity of the Carnegie Works?

Mr. GRACE. I should imagine about 10,000 tons per year. I should imagine we are 2,000 or 3,000 tons a year higher than they are in capacity.

The CHAIRMAN. And you do not know what the Midvale capacity is?

Mr. GRACE. No; I do not.

The CHAIRMAN. Have you any estimate of Midvale in your own mind?

Mr. GRACE. Well, I should say from 6,000 to 7,000 tons.

The CHAIRMAN. Well, all three of you could not make more than 20,000 tons?

Mr. GRACE. Oh, yes; we could make 25,000. We can make the armor for three ships, requiring about 24,000 or 25,000 tons.

Mr. PADGETT. Twelve and nine would be twenty-one and six would be twenty-seven. Say, conservatively, 25,000 tons.

The CHAIRMAN. I have asked you all the questions I wanted. I haven't got all the answers I would like to get.

Mr. GRACE. I want to answer them frankly. I have tried to tell the truth.

The CHAIRMAN. I don't doubt that.

Mr. GRACE. And if I have made any mistakes I will be glad to correct them.

Mr. PADGETT. Senator, if you are through, I would suggest that you swear the superintendent of the armor plant and the auditor now, and when we send the transcript of this hearing we will send the same list of questions to each one of them.

The CHAIRMAN. And you think that will cover their written reply?

Mr. PADGETT. We will send the same list of questions to the superintendent of the armor plant and to the auditor, and each one of you will make your own individual responses. They may be the same answers or they may not be the same answers. We will submit the same questions.

Mr. GRACE. They are bound to give the same information because the information will all come from our records.

Mr. PADGETT. And I presume the others will decline to answer the questions just as Mr. Grace has declined to answer them, but we wanted to submit these questions to more than one person, not just grouping the answers to one set of questions, but we will have three

sets of questions; they will be the same questions submitted to three individuals, and each individual will answer for himself upon his oath.

(Accordingly the chairman administered the oath to Mr. W. F. Roberts, general superintendent of the Lehigh plant of the Bethlehem Steel Co., and to Mr. F. A. Shick, comptroller and auditor of the Bethlehem Steel Co.)

### STATEMENT OF MR. W. F. ROBERTS.

Mr. W. F. Roberts, being duly sworn, testified as follows:

The CHAIRMAN. What is your name?

A. W. F. Roberts.

The CHAIRMAN. What is your official connection with the Bethlehem Steel Co.?

A. General superintendent, Bethlehem Steel Co.

Q. How much does it cost your company f. o. b. to produce a ton of K. C. armor, class A-1; that is, material, labor, and shop overhead charges?—A. Same answer as made by Mr. E. G. Grace, president, Bethlehem Steel Co.

Q. How much do you add to this cost for deterioration of plant and administration expenses?—A. Same as to first question.

Q. Has this cost been reached by taking the annual output of a single year, or of a term of years, and making allowance for rejections and ballistic failures?—A. Same as to first question.

Q. What are the various components of this cost per ton?—A. Same as to first question.

Q. What is the cost per ton of the armor ingot at the forge, including all rejections?—A. Same as to first question.

Q. Give the components, with their unit prices, that enter into a furnace charge for an armor heat?—A. Same as to first question.

Q. How much repair and preparation cost for the open-hearth furnace is made for each heat?—A. Same as to first question.

Q. How much does this amount to per ton of armor ingot produced?—A. Same as to first question.

Q. How much does the repair and preparation cost of the ladles amount to for each ton of ingot?—A. Same as to first question.

Q. What is the fuel charge for each ton of ingot?—A. Same as to first question.

Q. What is the proportional laboratory superintendence charge for each ton of ingot?—A. Same as to first question.

Q. What is the lifting, stripping, and chipping charge per ton of ingot?—A. Same as to first question.

Q. What is the power charge, including steam, electric and water, for each ton of ingot?—A. Same as to first question.

Q. What is the cost for forging?—A. Same as to first question.

Q. What scrap allowance is made for condemned ingots?—A. Same as to first question.

Q. How many tons of armor ingots did your company manufacture last year?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. What was the total number of these ingots in tonnage which were rejected before reaching forge?—A. Same as to first question.

Q. How many tons of ingots were forged during the past year?—A. Same answer as made by Mr. E. G. Grace, president, Bethlehem Steel Co.



Q. How many tons were rejected during the forging?—A. Same as to first question.

Q. What scrap allowance was made for these rejected during forging?—A. Same as to first question.

Q. What was the oxidization and scale loss at the forge?—A. Same as to first question.

Q. What did the labor for forging each ton of ingot amount to?—A. Same as to first question.

Q. What did the fuel for each ton of ingot forged amount to?—A. Same as to first question.

Q. What did the repairs to heating furnaces amount to for each ton of armor?—A. Same as to first question.

Q. What did the electric power, light, steam, water, drafting, transportation, and inspection per ton of plate amount to during the forging?—A. Same as to first question.

Q. Of all the ingots forged and not rejected, what percentage was discarded? How many tons?—A. Same answer as made by Mr. E. G. Grace, president, Bethlehem Steel Co.

Q. What allowance was made for the metal thus discarded?—A. Same as to first question.

Q. What is the unit price per ton of plate when ready for carbonizing?—A. Same as to first question.

Q. How many tons of armor plate were carbonized at the works of your company last year?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. What was the oxidization and scale in this treatment, in tons?—A. Same as to first question.

Q. What were the total number of plates rejected during carbonization?—A. Same as to first question.

Q. What does the labor per ton of carbonized plate amount to?—A. Same as to first question.

Q. What does the material per ton of carbonized plate amount to?—A. Same as to first question.

Q. How much fuel per ton of plate is used in carbonizing?—A. Same as to first question.

Q. How much did the furnace repairs per ton of carbonized plate amount to?—A. Same as to first question.

Q. What does the proportional amount of steam, electric power, lighting, drafting, inspection, laboratory, transportation, amount to per ton of carbonized plate?—A. Same as to first question.

Q. How much is the carbonized plate worth per ton; no machining?—A. Same as to first question.

Q. How many tons of armor plate were reformed by your company during the past year?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How many tons of plate were rejected during the reformatting process, and was any allowance for the recovered material made in working the cost of armor?—A. Same as to first question.

Q. What does the labor per ton for reformatting amount to?—A. Same as to first question.

Q. What do the repairs per ton for reformatting amount to?—A. Same as to first question.

Q. What does the fuel per ton for reformatting amount to?—A. Same as to first question.

Q. What is the proportional amount of power—electric, steam, water—for reforcing?—A. Same as to first question.

Q. What does the proportional drafting, inspection, transportation, and laboratory for reforcing amount to?—A. Same as to first question.

Q. How much discard is made after reforcing?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. What allowance is made for this discard in reckoning the cost?—A. Same as to first question.

Q. What is the cost of armor per ton after reforcing?—A. Same as to first question.

Q. How many tons of armor plate were sent to treatment by your company during the past year?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How many tons were lost during treatment by rejection?—A. Same as to first question.

Q. What does the labor per ton of treated plate amount to?—A. Same as to first question.

Q. What does the material per ton of treated plate amount to?—A. Same as to first question.

Q. What do the repairs per ton of treated plate amount to?—A. Same as to first question.

Q. What does the fuel per ton of treated plate amount to?—A. Same as to first question.

Q. What do the proportional charges per ton of treated plate amount to?—A. Same as to first question.

Q. What is the total cost per ton of treated and rectified plate?—A. Same as to first question.

Q. How many tons of armor plate were sent to machining by your company last year?—A. Same as to first question.

Q. How many tons of machined plate were produced last year?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. Were there any rejections during the process of machining; if so, how many tons, and what allowance was made for the rejected material in reckoning the final cost?—A. Same as to first question.

Q. How much per ton does the labor of machining amount to?—A. Same answer as to first question.

Q. How much does the machined scrap amount to?—A. Same as to first question.

Q. How much does the material for machining amount to, including oil, waste, repairing of tools, supply of tools?—A. Same as to first question.

Q. How much do the repairs per ton of machined plate amount to during the machining operation?—A. Same as to first question.

Q. What do the proportional charges per ton of machined plate amount to?—A. Same as to first question.

Q. What is the cost per ton of machined plate produced?—A. Same as to first question.

Q. How many tons of machined plate were presented by your company for shipment last year?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. What do the labor and material for preparation for shipment amount to per ton of finished plate?—A. Same as to first question.



Q. How are the total water, steam, power, transportation, inspection, drafting, and laboratory charges reckoned?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. What were the total power charges for your plant last year—by power charges is meant electric power, steam power, water power, or producer gas for running engines, as the case may be—and how did you arrive at the method of assigning the various proportions to the various operations?—A. Same as to first question.

Q. The same information is desired for the laboratory, drafting, inspection, and transportation charges.—A. Same as to first question.

Q. What is the cost per ton of shipped plate, class A-2?—A. Same as to first question.

Q. What is the cost per ton of shipped plate, class B?—A. Same as to first question.

Q. What was the average cost per ton of class C, steel armor?—A. Same as to first question.

Q. What do you reckon your working capital to be?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. What does the maintenance of your plant amount to per annum?—A. Same as to first question.

Q. Is this amount over and above the repairs which have been charged to the various operations comprising the total manufacture and separate from depreciation?—A. Same as to first question.

Q. What does this maintenance mean; to what is it applied?—A. Same as to first question.

Q. What is the total of proportional administration charges made to armor; how has this been arrived at?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. Give a tabulated list showing the various salaries paid, and how proportionally divided, so as to include the armor plant?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How much do the insurance charges on the armor plant amount to?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How much taxes are chargeable to the armor plant?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How much do you charge to armor in behalf of the pension fund and liability fund?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How much depreciation is charged against the armor plant; what is this depreciation; how has it been arrived at?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. After a year's operations within which a certain sum of money has been set aside from the proceeds of the manufacture of armor for depreciation charge, what is done with this money?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. After depreciation charge has been made to a year's operation, and there have been no replacements of tools, is this amount used to amortize the original investment?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. Since the erection of your armor plant what has been the total amount of depreciation which has been charged into the cost of armor?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How much, if any, of this sum of money has been actually used for the installation of new machinery in place of old, for building new buildings, furnaces, etc., in place of old, and has this expenditure been added to the capital account?—A. Same as to first question.

Q. The remainder of this sum which has not been expended, has it been used for amortizing any of the original investment?—A. Same as to first question.

Q. How much money is invested in your armor plant?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. Does this represent the total amount which has been expended for this plant, inclusive of all depreciation replacements?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. In reckoning your profit, is it reckoned as a profit on the total amount which has been put into the armor plant, or on the amount which has been put into the armor plant less all depreciation which has not been used for the purpose of replacement?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

#### STATEMENT OF MR. F. A. SHICK.

Mr. F. A. Shick, being duly sworn, testified as follows:

The CHAIRMAN. What is your name?

Mr. SHICK. F. A. Shick.

The CHAIRMAN. What is your official connection with the Bethlehem Steel Co.?

Mr. SHICK. Comptroller and auditor, Bethlehem Steel Co.

Q. How much does it cost your company f. o. b. to produce a ton of K. C. armor, class A-1; that is, material, labor, and shop overhead charges?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How much do you add to this cost for deterioration of plant and administration expenses?—A. Same as to first question.

Q. Has this cost been reached by taking the annual output of a single year, or of a term of years, and making allowance for rejections and ballistic failures?—A. Same as to first question.

Q. What are the various components of this cost per ton?—A. Same as to first question.

Q. What is the cost per ton of the armor ingot at the forge, including all rejections?—A. Same as to first question.

Q. Give the components, with their unit prices, that enter into a furnace charge for an armor heat?—A. Same as to first question.

Q. How much repair and preparation cost for the open-hearth furnace is made for each heat?—A. Same as to first question.

Q. How much does this amount to per ton of armor ingot produced?—A. Same as to first question.

Q. How much does the repair and preparation cost of the ladles amount to for each ton of ingot?—A. Same as to first question.

Q. What is the fuel charge for each ton of ingot?—A. Same as to first question.

Q. What is the proportional laboratory superintendence charge for each ton of ingot?—A. Same as to first question.

Q. What is the lifting, stripping, and chipping charge per ton of ingot?—A. Same as to first question.



Q. What is the power charge, including steam, electric, and water, for each ton of ingot?—A. Same as to first question.

Q. What is the cost for forging?—A. Same as to first question.

Q. What scrap allowance is made for condemned ingots?—A. Same as to first question.

Q. How many tons of armor ingots did your company manufacture last year?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. What was the total number of these ingots in tonnage which were rejected before reaching forge?—A. Same as to first question.

Q. How many tons of ingots were forged during the past year?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How many tons were rejected during the forging?—A. Same as to first question.

Q. What scrap allowance was made for these rejected during forging?—A. Same as to first question.

Q. What was the oxidization and scale loss at the forge?—A. Same as to first question.

Q. What did the labor for forging each ton of ingot amount to?—A. Same as to first question.

Q. What did the fuel for each ton of ingot forged amount to?—A. Same as to first question.

Q. What did the repairs to heating furnaces amount to for each ton of armor?—A. Same as to first question.

Q. What did the electric power, light, steam, water, drafting, transportation, and inspection per ton of plate amount to during the forging?—A. Same as to first question.

Q. Of all the ingots forged and not rejected, what percentage was discarded? How many tons?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. What allowance was made for the metal thus discarded?—A. Same as to first question.

Q. What is the unit price per ton of plate when ready for carbonizing?—A. Same as to first question.

Q. How many tons of armor plate were carbonized at the works of your company last year?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. What was the oxidation and scale in this treatment, in tons?—A. Same as to first question.

Q. What were the total number of plates rejected during carbonization?—A. Same as to first question.

Q. What does the labor per ton of carbonized plate amount to?—A. Same as to first question.

Q. What does the material per ton of carbonized plate amount to?—A. Same as to first question.

Q. How much fuel per ton of plate is used in carbonizing?—A. Same as to first question.

Q. How much did the furnace repairs per ton of carbonized plate amount to?—A. Same as to first question.

Q. What does the proportional amount of steam, electric power, lighting, drafting, inspection, laboratory, transportation, amount to per ton of carbonized plate?—A. Same as to first question.

Q. How much is the carbonized plate worth per ton; no machining?—A. Same as to first question.

Q. How many tons of armor plate were reformed by your company during the past year?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How many tons of plate were rejected during the reforming process, and was any allowance for the recovered material made in working the cost of armor?—A. Same as to first question.

Q. What do the labor per ton for reforming amount to?—A. Same as to first question.

Q. What does the repairs per ton for reforming amount to?—A. Same as to first question.

Q. What does the fuel per ton for reforming amount to?—A. Same as to first question.

Q. What is the proportional amount of power—electric, steam, water—for reforming?—A. Same as to first question.

Q. What does the proportional drafting, inspection, transportation, and laboratory for reforming amount to?—A. Same as to first question.

Q. How much discard is made after reforming?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. What allowance is made for this discard in reckoning the cost?—A. Same as to first question.

Q. What is the cost of armor per ton after reforming?—A. Same as to first question.

Q. How many tons of armor plate were sent to treatment by your company during the past year?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How many tons were lost during treatment by rejection?—A. Same as to first question.

Q. What does the labor per ton of treated plate amount to?—A. Same as to first question.

Q. What does the material per ton of treated plate amount to?—A. Same as to first question.

Q. What do the repairs per ton of treated plate amount to?—A. Same as to first question.

Q. What does the fuel per ton of treated plate amount to?—A. Same as to first question.

Q. What do the proportional charges per ton of treated plate amount to?—A. Same as to first question.

Q. What is the total cost per ton of treated and rectified plate?—A. Same as to first question.

Q. How many tons of armor plate were sent to machining by your company last year?—A. Same as to first question.

Q. How many tons of machined plate were produced last year?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. Were there any rejections during the process of machining; if so, how many tons, and what allowance was made for the rejected material in reckoning the final cost?—A. Same as to first question.

Q. How much per ton does the labor of machining amount to?—A. Same as to first question.

Q. How much does the machined scrap amount to?—A. Same as to first question.



Q. How much does the material for machining amount to, including oil, waste, repairing of tools, supply of tools?—A. Same as to first question.

Q. How much do the repairs per ton of machined plate amount to during the machining operation?—A. Same as to first question.

Q. What do the proportional charges per ton of machined plate amount to?—A. Same as to first question.

Q. What is the cost per ton of machined plate produced?—A. Same as to first question.

Q. How many tons of machined plate were presented by your company for shipment last year?—A. Same answer as made by Mr. E. G. Grace, president, Bethlehem Steel Co.

Q. What do the labor and material for preparation for shipment amount to per ton of finished plate?—A. Same as to first question.

Q. How are the total water, steam, power, transportation, inspection, drafting, and laboratory charges reckoned?—A. Same answer as made by Mr. E. G. Grace, president, Bethlehem Steel Co.

Q. What were the total power charges for your plant last year—by power charges is meant electric power, steam power, water power, or producer gas for running engines, as the case may be—and how did you arrive at the method of assigning the various proportions to the various operations?—A. Same as to first question.

Q. The same information is desired for the laboratory, drafting, inspection, and transportation charges?—A. Same as to first question.

Q. What is the cost per ton of shipped plate, class A-2?—A. Same as to first question.

Q. What is the cost per ton of shipped plate, class B?—A. Same as to first question.

Q. What was the average cost per ton of class C steel armor?—A. Same as to first question.

Q. What do you reckon your working capital to be?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. What does the maintenance of your plant amount to per annum?—A. Same as to first question.

Q. Is this amount over and above the repairs which have been charged to the various operations comprising the total manufacture, and separate from depreciation?—A. Same as to first question.

Q. What does this maintenance mean; to what is it applied?—A. Same as to first question.

Q. What is the total of proportional administration charges made to armor; how has this been arrived at?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. Give a tabulated list showing the various salaries paid, and how proportionately divided, so as to include the armor plant?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How much do the insurance charges on the armor plant amount to?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How much taxes are chargeable to the armor plant?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How much do you charge to armor in behalf of the pension fund and liability fund?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How much depreciation is charged against the armor plant; what is this depreciation; how has it been arrived at?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. After a year's operations within which a certain sum of money has been set aside from the proceeds of the manufacture of armor for depreciation charge, what is done with this money?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. After depreciation charge has been made to a year's operation and there have been no replacements of tools, is this amount used to amortize the original investment?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. Since the erection of your armor plant what has been the total amount of depreciation which has been charged into the cost of armor?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. How much, if any, of this sum of money has been actually used for the installation of new machinery in place of old, for building new buildings, furnaces, etc., in place of old, and has this expenditure been added to the capital account?—A. Same as to first question.

Q. The remainder of this sum which has not been expended, has it been used for amortizing any of the original investment?—A. Same as to first question.

Q. How much money is invested in your armor plant?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. Does this represent the total amount which has been expended for this plant, inclusive of all depreciation replacements?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

Q. In reckoning your profit, is it reckoned as a profit on the total amount of money which has been put into the armor plant, or on the amount which has been put into the armor plant less all depreciation which has not been used for the purpose of replacement?—A. Same answer as made by Mr. E. G. Grace, president Bethlehem Steel Co.

**FRIDAY, NOVEMBER 27, 1914.**

SPECIAL COMMITTEE,  
*Philadelphia, Pa.*

The committee met at 10.45 a. m. at the office of the Midvale Steel Co., Hon. B. R. Tillman (chairman) presiding.

Present, Hon. L. P. Padgett, Member of Congress; Rear Admiral J. Strauss, United States Navy, members of the committee. Lieut. Commander C. C. Bloch, United States Navy, and Lieut. Commander H. E. Cook, United States Navy; Mr. J. B. Knight and Mr. E. S. Theall, assistants to the committee.

There were also present Mr. W. P. Barba and Mr. J. B. King, representing the Midvale Steel Co.

#### **STATEMENT OF MR. WILLIAM P. BARBA, MANAGER OF THE MIDVALE STEEL CO.**

Mr. W. P. Barba, having been duly sworn, testified as follows:

The CHAIRMAN. Will you please tell us who you are and what position you hold with the company?

Mr. BARBA. William P. Barba, manager.



The CHAIRMAN. Manager of the Midvale Steel Co. ?

Mr. BARBA. Manager of the Midvale Steel Co.

The CHAIRMAN. What is the capitalization of that company ?

Mr. BARBA. Nine million seven hundred and fifty thousand dollars.

The CHAIRMAN. How much is watered stock ?

Mr. BARBA. None.

The CHAIRMAN. All solid investment ? Where is that stock owned ?

Mr. BARBA. It is owned chiefly by the two estates, the estate of Charles J. Harrah owning a majority and the estates of John Sellers and William Sellers owning the minority portion of that stock.

The CHAIRMAN. What dividends does it pay ?

Mr. BARBA. It paid three per cent during the year just closed.

The CHAIRMAN. Anything carried to profit and loss ?

Mr. BARBA. Well, of course, there is a small addition to the surplus. The books for the year 1913-1914 which closed on October 31, that being the end of our fiscal year, are not yet made up, but the dividend rate was reduced that year to three per cent from four per cent which we paid the year before, so you see there is not very much allotted to surplus in that year or we would not be reducing the dividend rate.

The CHAIRMAN. Has the company any debt ?

Mr. BARBA. No funded debt of any sort, only the one issue of stock—it is neither common nor preferred—and there is no funded debt.

The CHAIRMAN. Its financial conditions are entirely satisfactory ?

Mr. BARBA. Its financial conditions are entirely satisfactory. Of course, we have the regular obligations which are necessary in carrying on a business of this magnitude.

The CHAIRMAN. How long has this company been engaged in the manufacture of armor for the Government ?

Mr. BARBA. Since 1903.

The CHAIRMAN. Were you here then ?

Mr. BARBA. Yes, sir.

The CHAIRMAN. Do you know about the origin of the bid that the Midvale Steel Co. made ?

Mr. BARBA. At that time ?

The CHAIRMAN. Yes.

Mr. BARBA. No, sir; I was not in touch with that branch of our work at that time.

The CHAIRMAN. Who does know ? Who would be the one to interrogate on that one point ?

Mr. BARBA. You mean the original bid ?

The CHAIRMAN. Yes.

Mr. BARBA. I think that Mr. Petre, who was manager at that time, would be the man.

The CHAIRMAN. Is he here ?

Mr. BARBA. He retired from the service of this company in March of this year, and is now living in Europe.

The CHAIRMAN. He is not in this country at all ?

Mr. BARBA. No, sir. He reached an age which he thought entitled him to retire from any further active work.

The CHAIRMAN. Is there any other man who was in the employ of the company who had anything to do with that contract ?

Mr. BARBA. I think the president, Mr. Harrah, would know, but Mr. Petre was the active man. In this company the manager is the active man for the general work of the company.

The CHAIRMAN. Is Mr. Harrah in town?

Mr. BARBA. No; he is in New York; he is most of the time in New York; he is over here occasionally.

The CHAIRMAN. Well, will your books or your correspondence show the origin of that bid, why you made that bid?

Mr. BARBA. Will you let me ask you exactly what is meant by "the origin of the bid"?

The CHAIRMAN. Well, I wanted to know why you entered into competition with the other two firms. What was the inducement?

Mr. BARBA. I think my general knowledge will enable me to answer that question to your satisfaction. This company was the original and pioneer ordnance manufacturer for the United States Government, we having begun our ordnance work about 1880, when no one else was engaged in it, and we were not manufacturing armor alone of all the ordnance supplies required by the Government. We were manufacturing guns and projectiles, and ship and engine forgings, all of which were required by the Navy, but we were not manufacturing armor, and naturally we wanted to extend at that time our activities toward the supply of all ordnance materials, and we tried for several years to make a successful bid for armor before a plant was erected. I remember that our original bid contemplated beginning delivery in 26 months, during which time we hoped to be able to erect a plant that would enable us to begin delivery of the comparatively small sizes of armor which were required for the purposes of the Navy at that time, and after making several bids without success under those conditions we did begin the erection of an armor-manufacturing plant.

The CHAIRMAN. Without having any contract at all?

Mr. BARBA. Without having any contract at all; and we went right on bidding, and finally, when the *Mississippi* and *Idaho* were let, we were allowed a portion of the armor required for those ships. Our plant was then practically completed, and we had made experimental firings at Indian Head, I think, in the winter of 1903.

The CHAIRMAN. Was it generally believed among those who were in the business of armor making that armor making was very profitable?

Mr. BARBA. We naturally thought that we would make a profit, or we would not have spent all those millions of dollars that we did.

The CHAIRMAN. Didn't you believe that Carnegie and Bethlehem had a good thing, and therefore you wanted to share in it?

Mr. BARBA. Unquestionably.

The CHAIRMAN. What was the character of the first bid?

Mr. BARBA. You mean the prices?

The CHAIRMAN. Yes.

Mr. BARBA. Would you let me send for a memorandum on that? I want to be accurate.

The CHAIRMAN. We want you to be entirely accurate, because we want to get at the facts, so as to be able to report to Congress just what, in our judgment, the policy of the Government ought to be. You know it is contemplated now that the Government shall build



its own armor-plate factory, in order to be free from the hold-up which we believe is now being followed by the combination that is robbing the Government and charging excessive prices.

Mr. BARBA. I have prepared a memorandum, Senator, which is still in very rough form, thinking that you might want to ask me exactly that line of questions, what our bids were at the different periods when we bid successfully and unsuccessfully for armor, and just as much of that memorandum as you like you can have, either as a reply to this question or to any others you may want to ask.

The CHAIRMAN. Later we will submit a series of questions prepared by the committee, and probe as deeply as you will allow us to go. We have been very unfortunate in our previous efforts to get at the bottom facts by unwillingness of the companies to expose their secrets to their competitors at home and abroad, and the general answer has been, "I do not know," or, "I am not willing to tell," and therefore we have all retired gracefully, and bowed our thanks, thankful for what we got, although it was little or nothing. Now, we want you to open up and tell us all about this matter, because you realize that if the Government enters into its own armor manufacture itself it will destroy your business in that respect, at least.

Mr. BARBA. Unquestionably.

The CHAIRMAN. That is, you will make no more armor, and it would be very unfortunate for the company as well as ourselves if we (meaning the Government) were to manufacture our own armor because it would be much better if we should have the manufacturers supply the Government at a reasonable price; instead of combining they should compete, but we have found that they would not compete and we believe are in a combine. We may be wrong. Will you open up your books and let us see whether you are in the combine?

Mr. BARBA. You go ahead with your questions and I will answer them faithfully.

The CHAIRMAN. Another question right there. Would you be willing for the Navy Department to send an expert bookkeeper over here and go through your books?

Mr. BARBA. Certainly not.

The CHAIRMAN. Why not?

Mr. BARBA. These books are our private property. They are the basis of our business.

The CHAIRMAN. Hasn't the Government the power, under the Department of Commerce, to send an expert?

Mr. BARBA. And keep matters confidential; yes. Mr. Daniels refused to keep these things confidential when we were asked to furnish them, and we said we would give them if they were kept confidential.

The CHAIRMAN. He couldn't afford to huggermugger behind the curtain and appear to be acting in collusion with you, therefore he had to be open.

Mr. BARBA. You are still more open than he.

The CHAIRMAN. We do not want you to answer anything that you are not willing to answer, and we would not probe in that direction; but you say you are willing to give us all the facts, and when I ask

you if you would be willing to let an expert from the Navy Department come here and go through your books, you say, "No."

Mr. BARBA. Yes, sir.

The CHAIRMAN. Well, how are we going to get at the bottom facts and understand really what armor costs you, except to take your word for it?

Mr. BARBA. Is it essential that you should know what armor costs us? It appears to be essential for you to know what armor is going to cost the United States to manufacture.

The CHAIRMAN. And how are we going to find that out except by going to those men who are now manufacturing armor and finding out the truth?

Mr. BARBA. Your officers who are stationed in the works, particularly in these works, have access to the whole manufacturing with the exception of some work which we ask them to retain as confidential, having reference to our processes, etc. Estimates have been made from time to time by these officers, whom you have stationed here to inspect the integrity of the work we manufacture. I say that these officers have made estimates and returns to the department of what, in their judgment, constitutes the cost of armor as manufactured at these works, and presumably the same at other works. These figures have been published. Were we to disclose the books of the company in the way that you propose, it would be no more possible to avoid disclosure of what those books show than has been the case in the past when presumably confidential reports were sent in to the department, and we wish to protect ourselves against that condition, much as I personally believe it to be to the interest of this company to tell you what armor costs us to manufacture; because I firmly believe that if you knew what it cost this company to manufacture armor under the present specifications it would be the strongest possible deterrent in the purpose of the Government, as expressed in the last naval act, to build its own plant.

The CHAIRMAN. Well, if we could feel satisfied that the Government is not suffering from a combination and was actually getting competition, I do not have any idea that the Government would build any armor factory at all, but we found that the reduction in the cost of powder was so great when the Government went into its manufacture, that we feel that if the Government makes its own armor it will get an equal reduction there.

Mr. BARBA. I really know nothing about the manufacture of powder, except the debates in Congress have shown the prevailing prices and the present prices of the manufacture of powder, and the reports of Admiral Strauss show what the powder costs him to manufacture at Indian Head. I know little of the overhead costs of the plant required for powder, but I do know from our close touch with the manufacture of armor and gun forgings and the finished guns, and the discussions that we have had on these subjects in the Navy Department, in the Bureau of Ordnance, from time to time during the past years, that the Government does not manufacture its present lines of manufacture on the same lines that a commercial concern is compelled to follow. We are in competition with the world on our commercial lines of manufacture, and we know.

The CHAIRMAN. Right here, do you make armor for other Governments? Has this company had foreign contracts?



Mr. BARBA. Just one; for the Italian Government.

The CHAIRMAN. For what battleship?

Mr. BARBA. The *San Marco* and the *San Gorgio*.

The CHAIRMAN. Was it the same type of armor that you are manufacturing for the United States?

Mr. BARBA. Practically. We made a bid of \$455.70 per ton for 2,100 tons for the Italian Government and were awarded the contract, and in addition to the gross sum we received about \$15,000 more on that contract for some peculiarities of the specifications, which reimbursed us for the scrap which was cut off, such as the holes in the port plates, like the one you saw in the shop this morning. The Italian Government paid for that material, as well as the shipped plate, so that while the contract price was \$455 per ton, we really received more than that. The date was approximately 1906-7.

The CHAIRMAN. What does your present contract with the Government amount to?

Mr. BARBA. The amount?

The CHAIRMAN. The amount of armor plate that you are manufacturing.

Mr. BARBA. Let me define that a little more closely. You mean the contract that you saw them manufacturing out there this morning for the *Arizona*.

The CHAIRMAN. The last one Admiral Strauss gave you.

Admiral STRAUSS. The very recent one.

Mr. BARBA. The very recent one will be for the armor for one ship, the *Mississippi*, amounting approximately to 8,500 tons, and at a base price of \$425 per ton.

The CHAIRMAN. Was that your bid, or were you compelled to lower that a little?

Mr. BARBA. We were compelled to lower it from the original figure of \$436. The Secretary had two or three conferences with us and asked us to revise our bid, which we did, and we finally offered the Secretary a letter containing a sealed bid—that is, a nondisclosed bid—and in that letter we advised him that we would be glad to take the armor for one ship, which was our capacity at this time, at the lowest prices which any competitor offered him at this time, and he thereupon wrote us offering us that armor at \$425 a ton, our bid having been revised from \$436 a ton to \$427 a ton, and we accepted the armor for one ship at a base price of \$425 per ton.

The CHAIRMAN. Have you kept your books in a way to find out for your own satisfaction just what armor plate costs you?

Mr. BARBA. We believe we have. We aim to do so.

The CHAIRMAN. Will you tell us?

Mr. BARBA. The cost as disclosed by the books I must decline to, much as I should like to give it, and I believe it would be a useful thing, but we are advised by counsel to reserve the disclosure of our costs upon our books. That is a matter entirely private to the higher officers of this company.

The CHAIRMAN. You say the papers and correspondence in relation to the first contract are not here, or are here?

Mr. BARBA. Unquestionably we have those papers on file.

The CHAIRMAN. Will you be willing to allow our expert examine those?

Mr. BARBA. You mean the papers comprising the bids?

The CHAIRMAN. Why did Midvale bid? That is what I want to know. Will that correspondence show why you bid?

Mr. BARBA. The original correspondence, Senator? In that case there is no correspondence except that we replied to the Government's invitation to bid and introduced a bid. Probably I do not understand the purport of your question.

The CHAIRMAN. What I am really after is to get at the facts which led this company to go in and bid for armor plate when Carnegie and Bethlehem seemed to have the business so tightly gripped that it was not worth while. I was on the Naval Committee at the time and I remember hearing a rumor rather than any direct information that Midvale would bid, and it finally did bid and got a contract because it was lower than the other two, and then President Roosevelt of his own volition, and without any authority of law, divided it up and gave Bethlehem and Carnegie part of it, you only getting one-third of the original contract.

Mr. BARBA. In the original contract which we secured?

The CHAIRMAN. I would like to know the amount of armor and the price Midvale bid. I can get that in the Navy Department, of course.

Mr. BARBA. This original contract given to Midvale was for armor for the *Mississippi* and *Idaho*. There were about 16,000 tons required, and Midvale was awarded a little over one-third of that armor, having bid for class A \$398 per ton; Carnegie's and Bethlehem's bids at that time were alike at \$420 per ton. This was in October, 1903.

Mr. PADGETT. The Bethlehem and Carnegie companies were required to come to your bid, I believe.

Admiral STRAUSS. How much was that, 5,000 tons?

Mr. BARBA. Yes.

Admiral STRAUSS. Was it profitable to the company to manufacture that 5,000 tons at \$398 per ton?

Mr. BARBA. Being an initial contract it certainly was not, because we had everything to shake down, all kinds of difficulties to meet. Mr. Padgett's question, as to whether Bethlehem and Carnegie received their armor at the price at which we received ours, should be answered negatively. The Bethlehem and Carnegie companies were awarded their proportions of armor at their prices, their average being, plus royalties, \$450.60 per ton as against an average price of \$397 bid by Midvale, which asked no royalty, so that one-third of the *Mississippi* and *Idaho* armor was placed with us at \$397 net, and two-thirds were placed with Bethlehem and Carnegie at \$450.60 net.

The CHAIRMAN. Those were the facts as disclosed by the official records?

Mr. BARBA. So far as we can get them; yes.

Admiral STRAUSS. Are you not mistaken in saying that this 16,000 tons was for the *Idaho* and *Mississippi*?

Lieut. Commander BLOCH. The armor for the *Vermont*, *Kansas*, and *Minnesota* was advertised for at the same time.

The CHAIRMAN. How long did it take you to produce that 5,000 tons?

Mr. BARBA. I can not answer that accurately, but if you will leave the question open I will supply it later. (Further answer to question 54—About two years.)



The CHAIRMAN. Will you tell the committee how much money you had invested in your armor plant when you started to produce that armor?

Mr. BARBA. I can only speak from general knowledge and would not like this answer to go down as an accurate statement. The general knowledge I have handed to me by the conversations with Mr. Petre, my predecessor, at different times, showed that we had approximately \$3,000,000 in cash laid aside for the purpose of building this armor plant, and that the construction required all of this three million and practically two million more at that time.

The CHAIRMAN. In other words, you mean to say that you spent \$5,000,000?

Mr. BARBA. At that time, and have extended the plant very materially since.

Mr. PADGETT. What time was that you speak of, that you expended \$5,000,000?

Mr. BARBA. 1903.

Mr. PADGETT. I have before me House Document No. 193, Fifty-ninth Congress, second session, "Cost of Armor Plate and Armor Plant," the report of the committee that was investigating it, in which, on page 30, appears the following:

The Midvale Co. furnished the board with general figures as to the cost of its armor plant, omitting any details of how this cost is made up. The statement of this company shows that it has expended on its armor plant somewhat in excess of \$3,500,000, but explains that the amount is not accurately stated because of the transfer to armor plant of certain tools installed previous to its entering the field of armor making, and to the further fact that certain other tools that might fairly be classed as armor plant are not exclusively used in that plant. The company further states that this estimate does not include the value of the ground occupied or interest on the construction investment, but does take account of the cost of designing and superintendence.

Now, in 1903, I understand you to have stated that you had expended \$5,000,000, and this statement that was furnished in 1906 put the amount, as I have just read, at \$3,500,000.

Mr. BARBA. My answer also included that I have no accurate knowledge on this matter, but that in conversation with Mr. Petre, the manager up to the beginning of this year, I had gathered that such were the facts.

Mr. PADGETT. Yes. Can you put into your hearings, when they come to you for revision, a statement as to the cost at different periods, say in 1903, 1906, and at the present time?

Mr. BARBA. I think that can be done. I shall be very glad to take the matter up when I see the form of your question.

Mr. PADGETT. When the question comes back to you for revision I would be glad if you would give us those figures, and any answer to this question necessary for information.

Mr. BARBA. I understand. [Further answer to question:] We find by examination of our books that in 1903, the armor plant being still uncompleted, we have no book value. In 1906-1907 the book value of our armor plant was \$3,905,527.12. In 1914 the book value of our armor plant was \$4,993,654.17, after having been depreciated yearly by a rate approximating  $7\frac{1}{2}$  per cent yearly depreciation. This rate has been found to be too low and a rate more nearly a 10 per cent basis will have to be used in future, owing to the great wear and tear on machinery and by reason of changing requirements as

to size, mass, quality of plates, etc. The reproduction costs of this plant and equipment would be much greater to-day.

The CHAIRMAN. You are aware that this committee has power to send for persons and papers? I think it very essential that we should get some papers that will show us why Midvale went into that competition with Carnegie and Bethlehem, also whether there is at this time any combination or not. Can you throw any light on that subject?

Mr. BARBA. Why we went into the competition?

The CHAIRMAN. Yes.

Mr. BARBA. As already indicated in a previous answer, we unquestionably believed that we could make a profit on the manufacture of armor at the prices which were then obtained for armor contracts, and I have no doubt, although no sure knowledge on this point, that estimates were made by the then officials of the company to show what in their belief would be the manufacturing cost of armor in 1903, so that they unquestionably satisfied themselves that at the then prevailing prices a profit could be obtained.

The CHAIRMAN. How long have you been associated with the company?

Mr. BARBA. Thirty-five years.

The CHAIRMAN. You were not anywhere near the top then?

Mr. BARBA. I was in charge of one of the manufacturing departments at that time.

Mr. PADGETT. May I ask you a question. If you could take a contract in 1903 at \$398 base price on the basis of 5,000 tons, I will ask you to state if the different companies could not afford to take a contract for 16,000 tons (the Bethlehem Co. has 16,000 tons), at less than \$425 per ton at the present time.

Mr. BARBA. Mr. Padgett, the answer to your question is a very simple one. The character of armor manufactured in 1903 in no way compares with the character of armor manufactured now, either in size, weight, or bulk of the individual pieces, the ballistic requirements, the character of projectiles used in testing armor, or even the cost of raw material and wages, both of which have very materially increased in the ten years that have elapsed in that period, and wages in particular have increased approximately 50 per cent through the necessity of manufacturing armor on the eight-hour law. You know most of our processes in manufacturing require operations both day and night. We therefore, have divided our gangs into three shifts of eight hours each and we have found it absolutely necessary to pay for eight hours work exactly what we formerly paid for ten hours work, so that the company gets absolutely no increase of production from most of these processes and is obliged to pay a very much larger sum in wages. At the same time the rate of wages has materially increased during the ten years that have elapsed. The character of the armor is very different, as your own technical men will affirm. The requirements are more severe. The difficulties of manufacture have been multiplied. I will not say that the percentage of rejections has increased, because I believe that the capacity of the makers to manufacture this newer type of armor has also advanced.

The CHAIRMAN. You mean their skill and knowledge?

Mr. BARBA. Their skill and knowledge have advanced. I think it would be quite an interesting study to look up the relative per-



centages of failing plates in 1903 and 1913. Possibly Mr. Bloch knows offhand what this amounts to. I must say I do not, but I am going to look it up through plain interest in the subject. So that, with the advancing requirements for the production of armor and the increasing difficulties, I believe that the price of armor to-day is too low as compared with the present-day cost of manufacture. As an illustration of that I do not mind telling you, Senator, this much from our books. We should really consider the manufacture of modern armor as represented only by the *Pennsylvania* armor or the *Arizona* armor because the specifications took a wide advance about that time. The cost of producing the *Arizona* armor is approximately \$20 per ton more than the cost of producing the *Pennsylvania* armor at this plant. [Further answer to question:] For the *Mississippi* and *Idaho*, which was our initial contract, there were 11 ballistic tests and no failures. These being the first groups of armor ever submitted by this company. In the most recently completed contracts, namely, the *Arizona* and *Pennsylvania*, there were four groups of armor, each requiring ordinarily four test plates for the acceptance of the four groups; to pass these four groups it was necessary to present eight plates, four of which failed on ballistic test, requiring substitution or further test plates to the number of an additional four plates, with the consequent loss to the manufacturer. Thus, the increased severity of specifications and difficulty of meeting them resulted in reducing the effective price per ton received by us by the amount of \$33 per ton on the contracts of 5,737 tons—\$190,000 for the *Arizona* and *Pennsylvania*.

Mr. PADGETT. Then, in your progress you are reducing the cost of manufacture?

Mr. BARBA. No; the cost and risk of manufacturing advanced with the most recent contract.

The CHAIRMAN. That is due to the severer specifications?

Mr. BARBA. To the severer specifications, and possibly to our lack of skill, as you remarked a moment ago. We might not have been very successful in that, but Admiral Strauss will confirm the fact that the specifications for battleship 39 were way in advance of the specifications for battleship 38, as a natural result of which the contract just about completed shows us an advance in cost of manufacture for battleship 39 over battleship 38 of approximately \$20 per ton.

Mr. PADGETT. You mentioned a moment ago about the eight-hour law. What do you estimate was the percentage of the increased cost of manufacturing due to the eight-hour law, if any? Was there any increased cost in adopting the eight-hour law? You get two hours less work. Do you get more efficient service during the 8 hours than you did during 10 hours?

Mr. BARBA. Mr. Padgett, you have opened up two very interesting questions. The first one, about the added cost due to the imposition of the eight-hour law, was one which we estimated, when making our price for the armor for the *Pennsylvania*, which was the first to be manufactured under the new eight-hour law, as approximately 10 per cent advance in cost; it was a most indeterminable point; the only thing you could figure on was wages. You do not know when you begin an armor plate how much money you are going to spend for wages. For instance, if you have a failing plate and you are re-

quired to re-treat a group or a portion of the group, each of those plates that are re-treated stands you very close to a thousand dollars for each re-treatment, and the wages all go in there at the advanced rate. We found it necessary to take men off the 10-hour or the 12-hour shifts and pay them the same money for eight hours that we formerly paid them for 10 hours or 12 hours, so that the 10-hour man or the 12-hour man had his rate of wages per day increased 50 per cent.

Admiral STRAUSS. Did you pay by the hour when you cut the hours of labor down?

Mr. BARBA. We give exactly the same rate for a period covering three weeks that they had made in the same period when working under the 10-hour basis or the 12-hour basis. The men in three shifts were paid the same money, because each shift, being reduced from 12 hours to 8 hours or from 10 hours to 8 hours, was paid the same for 8 hours that it formerly got for 10 hours or 12 hours. In other words, a cycle of three turns makes the A, B, and C shifts. That covers a cycle, so that in three weeks he is guaranteed the aggregate for three weeks that he got in three weeks under the old system.

Mr. PADGETT. Then, on the question of the efficiency of the service. What is the relative efficiency of the total 8 hours as compared with the efficiency of the total work of the 10 hours and of the 12 hours?

Mr. BARBA. Your question is an exact parallel to one that was asked me by the chairman of the committee of Federal industrial research last June, when discussing the eight-hour day, and if you do not mind I will tell you not only with reference to armor, but other kindred matters, because they are all tied together. The locomotive engineers, the crane operators, and repair men throughout all the works were working 10 hours per day on the maintenance machinery which is used to produce armor on an 8-hour basis. Now, that involves all kinds of operations, and I will answer your question this way. Where the man is working on a machine tool, some tool where his manual labor really amounts to a considerable number of motions and turns during the day, he is lifting and picking and turning and adjusting all day, he will unquestionably have a greater rate of efficiency per hour in an 8-hour day than he has a rate of efficiency per hour in a 10 or a 12 hour day. But where you take big tools, like the open-hearth furnaces in which this raw material is melted, and where the only labor is to keep the flow of gas and air adjusted, and where they are paid for these operations and paid for the skill and care—the man must not burn down that furnace—the rate of efficiency per hour is no greater in an 8-hour day than in a 10-hour day. Now, take the big presses on which we forge armor plate. There the men are under a little more physical strain—they are on their feet, and they have levers to handle, etc.—and there you would probably get slightly more efficiency in 8 hours than in 10. Take your armor a step further, into the machine shop, and this morning we all saw two men under a big drill press watching the drill do the work—certainly a nonfatiguing job—and the rate of efficiency for that and similar operations can be no more in an 8-hour day than it is in a 10-hour day. Therefore where probably the largest amount of your wages is spent you get no more efficiency in



an 8-hour day than in a 10-hour day, because it does not depend upon human labor, but simple watchfulness and being on the job.

The CHAIRMAN. I think you told me that these workmen were under piecework?

Mr. BARBA. Well, piecework is rather a bald statement to make, Senator, because we have a very great diversity of operations. Piecework means that you give a man so much money for doing so much work. That is not the most advanced and best way for promoting the efficiency of the man. We follow that to a very, very remote degree. The system we do follow is what is known as the premium rate, which puts a premium upon individual efficiency, paying an efficient man more money for the same operation than you do a less efficient man for performing the same operation. In that way you promote the efficiency of each individual man and not of a class of men.

The CHAIRMAN. If I understand the piecework system, it is to stimulate a man's ambition as well as his money-making propensities, and impels him, or induces him, to exert himself to the utmost to earn as much money as possible.

Mr. BARBA. That again is a more crude statement than the modern premium and bonus method should have, because it is the old-fashioned way of simply naming a rate for the job and letting the best man win. The better way, which allows each man to work to the best of his ability, largely mental rather than physical—because he often finds short cuts through every operation in which he is engaged—is the bonus system, where he is paid a bonus over a base if he succeeds in doing more work in a given time than the base contemplated, the base in every case guaranteeing a man his daily wage, so that the efficient man gets his day rate over which he earns a large bonus.

The CHAIRMAN. That is the same thing stated differently. If a man does more work on the piece rate than he does by the day, doesn't he get more compensation?

Mr. BARBA. Yes.

The CHAIRMAN. And you change it to the bonus system instead of the piece system?

Mr. BARBA. Because it gives each man an added incentive to put his best foot foremost and become a competent man on the job.

Mr. PADGETT. In other words, you guarantee him a minimum as his day wage, and then you pay him an increase in proportion to his efficiency.

Mr. BARBA. Exactly. That is the best statement of that thing that one could make.

Admiral STRAUSS. That being the case, of course this 50 per cent that you claim would not hold; if your wages are made up of a base rate plus a premium, if you shorten the hours, as has been done, you would not increase the pay 50 per cent, as you stated.

Mr. BARBA. Yes; and more; for the reason that the whole basis of the matter which the Senator opened is, as Mr. Padgett stated, the guaranty to each of these workmen his day rate. Now, if that man is hired at \$3 or \$4 per day, day rate, that means, on a 10-hour basis, 40 cents per hour. That means that in 8 hours he is getting \$4 just the same guaranteed to him, instead of having it guaranteed to him in 10 hours. Then on top of that his bonus for efficient work and superior production goes at an increased ratio because of his increase

per hour, because in modern piecework, Senator, the bonus is based on the hourly earning capacity of the man; so that a man who is getting 10 per cent bonus on 40 cents an hour, if his rate is raised to 50 cents an hour, his hourly rate becomes 50 cents an hour under the 8-hour day; then his bonus instead of being 10 per cent on 40 cents per hour becomes 10 per cent on 50 cents per hour.

The CHAIRMAN. You don't have to stick to that 10 per cent under the new law?

Mr. BARBA. We do not have to stick to anything except as demanded by working conditions, and the men require that they be allowed to make the same weekly pay roll on eight hours that they made on the ten-hour day.

Admiral STRAUSS. The committee has prepared a list of questions, and I will read them. One question has practically been asked you before.

Q. How much does it cost your company to produce a ton of K. C. armor, class A-1, f. o. b.; that is, material, labor, and shop overhead charges?

Mr. BARBA. As you say, I have practically answered that question, and would ask to be excused from giving this information in so public a way.

Q. How much do you add to this cost for deterioration of plant and administration expenses?—A. I will be glad to answer that question so far as my knowledge goes, leaving out the element of administration expenses, because in our method of keeping costs administration expenses are included in the overhead, which is proportioned to all of the products of the company in its various lines in accordance with the very best judgment that our accountants can apply to the amount of the overhead expenditures upon each of these lines of manufacture; and without more research than I have given to it up to date I can not tell you how much of the administration expense is charged to armor. The depreciation is applied at the rate of  $7\frac{1}{2}$  per cent on tools and machinery, and  $2\frac{1}{2}$  per cent on buildings, but we have found that the depreciation on machinery is too low, and beginning with the present fiscal year we shall raise it to 10 per cent on the average.

Admiral STRAUSS. When you say 10 per cent, do you mean that all of your plant here, devoted to the manufacture of armor, would either be renewed in 10 years or become obsolete or useless through advances made in the business?

Mr. BARBA. No, not at all. The method of cost accounting followed throughout the country for some number of years past has been to allow a horizontal rate of depreciation. That horizontal rate has been  $7\frac{1}{2}$  per cent of machinery, to kill the machinery in approximately 15 years, and it is perfectly true that much machinery dies in far less time than 15 years, while much machinery lives far beyond 15 years, and that average has been found to be fair, but lately there has been a move, which you, Admiral, at one time called the "fashion," to raise the average rate of depreciation to 10 per cent. We at Midvale have not yielded to the fashion so far as the 10 per cent horizontal rate goes, but we are striving so to apportion our rates of depreciation for different classes of machinery more in accordance with the actual period of their life than has been the case heretofore, and our new rate



of depreciation beginning the first of November, 1914, for the entire plant, not armor alone, will be based upon what we believe to be a more rational basis than the horizontal depreciation rate.

Admiral STRAUSS. Is there any big tool that you know of that has been scrapped since you began the manufacture of armor some ten or twelve years ago?

Mr. BARBA. Completely scrapped?

Admiral STRAUSS. Scrapped or become obsolete.

Mr. BARBA. The open-hearth furnaces have been rebuilt several times.

Admiral STRAUSS. That would happen to any steel-making plant as a charge for maintenance. That would not, of course, be included in depreciation.

Mr. BARBA. We have several traveling cranes which have been entirely overmatched by the increased-weight of plate and have been taken out and replaced.

Admiral STRAUSS. What did you do with the cranes?

Mr. BARBA. Scrapped them.

Admiral STRAUSS. You would not count that rebuilding of your furnaces a charge against depreciation. You would call that maintenance rather, would you not? That is a charge against production, not an extraordinary charge.

Mr. BARBA. The rebuilding of an open-hearth furnace is a thing that must be looked for in the natural course of operation, and, so far as the mere replacement of the bricks is concerned, it is not a serious matter, but when you are required to operate on a special product at a high pressure, such as the melting of armor-plate steel really is, very much more serious damage is done to the equipment in melting armor than in any other class of steel which we have to handle; then the rate of depreciation should rise, and we expect it to be raised in the future. That, of course, is a mere detail of our internal bookkeeping, and the answer to your question should really be confined to the horizontal rate of depreciation.

Admiral STRAUSS. On tools?

Mr. BARBA. Yes.

Admiral STRAUSS. Cranes?

Mr. BARBA. Yes.

Admiral STRAUSS. How many presses have you?

Mr. BARBA. Two; one for small forgings and the 10,000-ton press for large forgings.

Admiral STRAUSS. They are a part of the installation which you had when you went into the armor business?

Mr. BARBA. No; the large press was built primarily for armor and has been used almost never for any other purpose.

Admiral STRAUSS. Was your small press in existence before you went into the armor business?

Mr. BARBA. Yes; it was put in for gun forgings.

Admiral STRAUSS. Do you use that in the manufacture of armor?

Mr. BARBA. Just as seldom as the armor press is used for other purposes; almost never is the small press used for the manufacture of armor. When we first began the test plates and experimental work and such small parts were made under the small press.

Admiral STRAUSS. You state that it has been your custom to allow a depreciation percentage of  $7\frac{1}{2}$  per cent per annum on your armor plant investment?

Mr. BARBA. Yes.

Admiral STRAUSS. What became of this money? Is it a book-keeping operation?

Mr. BARBA. In our system of cost keeping and ledger accounting we have not applied the depreciation in the normal overhead. We have considered depreciation as parallel with capital investment, and we depreciate only in a lump sum at the end of the year when the ledger balances are taken off. Our depreciation, therefore, tends to reduce the capital value of the plant, and as such is fully comparable with capital invested, and the inventory value of the plant was reduced by the amount of depreciation or write-off, exactly as it was increased during the year by the amount of any new investment made for capital account.

Admiral STRAUSS. Then, as I understand it, at the end of 13 years from the beginning of this new industry your capital investment in the armor production will have been wiped out.

Mr. BARBA. At that rate, yes.

Admiral STRAUSS. Approximately.

Mr. BARBA. Yes.

Admiral STRAUSS. And the only thing that would exist at the end of 13 years would be such new equipment as you have added.

Mr. BARBA. Plus the maintenance that we have given tools not actually scrapped, which has been a very large account and in some systems of bookkeeping is applied to the capital account.

Admiral STRAUSS. You have been in the armor business since 1903; in other words, you have sold armor for 11 years, and barring any additions that you have made to your plant at the rate you have marked out, it will practically go off your books as capital in about two years.

Mr. BARBA. Yes; with the exception that as an offset to the final part of your statement must be made all the maintenance charges to keep the machinery from being scrapped and thrown out. That is, to keep the machinery in a condition of 100 per cent efficiency, which is just as necessary in the thirteenth year as it is in the first year.

Admiral STRAUSS. But don't you apply this to maintenance rather than to depreciation? That is a daily charge against the production of any article that you manufacture?

Mr. BARBA. As I say, there are two systems of thought, two systems of bookkeeping, and many of them charge major items of maintenance to the capital account. We have elected not to do that but to put it into our overhead working account.

Admiral STRAUSS. When you estimated your selling price of armor did you put in this  $7\frac{1}{2}$  per cent write off?

Mr. BARBA. I can not answer that now, Admiral. The chances are that that was left to the accountants to apply as was the habit of bookkeeping then and since, feeling sure that the whole plant would be averaged at  $7\frac{1}{2}$  per cent depreciation at the end of each year, taken out of the surplus account and being offset by additions to the same account for any new plant or equipment which we might purchase, but not, so far as the bookkeeping is concerned, by the addition to the capital account of maintenance charges.



Mr. PADGETT. Now, may I make a suggestion here. Where you can not answer a question now, will you insert it when the papers come back to you for revision?

Mr. BARBA. I shall be very glad to do that.

Mr. PADGETT. I should state here, once for all, that where you can not give the answer now, you might just say that you will give it later.

Mr. BARBA. Very good. Then we will rely upon the stenographer to indicate where the answers are to be supplied.

Admiral STRAUSS. He will give you a transcript of this hearing so that you can amend your answers, and it may occur to you that in some of the cases where you have declined to answer you may, on maturer consideration, make up your mind that you will disclose this information without prejudicing your interest, and the committee would be very glad to get your answers at that time.

The CHAIRMAN. At these other places where we have been there have been so many answers from the managers or the witnesses, "I don't know," that we have felt for their own sakes they ought to know because it shows them to be very careless business men in their bookkeeping, and while we are not sensitive about your ignorance, we would like you to consider these questions at your convenience, and if you feel that you can answer them rather than saying "I do not know" or "I do not want to say," you might put in the answer.

Mr. BARBA. Senator, my personal intention is to answer every question that comes within my knowledge.

The CHAIRMAN. I take that for granted.

Mr. BARBA. And I thank you very much for your suggestion, and I will be guided by it; and if I find that you want for some particular purpose more accurate answer than my memory provides I shall be glad to get it for you.

The CHAIRMAN. My idea is that if, as manufacturers, in computing costs, you are not taking into consideration those things that we are asking you about, which we consider vital to get at the facts, you may perhaps change your system of bookkeeping, and hereafter be guided by our questions rather than your own judgment.

Mr. BARBA. You must give me credit, also, of remembering that you have had time for a careful consideration of your questions and——

The CHAIRMAN (interposing). We have done the best we could.

Mr. BARBA. And when your questions come to me you might strike something about which I know perfectly, in a general way so far as guiding the policies or the management of this company is concerned, and for the details of which I necessarily rely upon the men whose business it is to have and to know all those details; and in such cases if your question requires an answer in detail I shall be very glad to furnish it in detail.

Q. Has this cost been reached by taking the annual output of a single year, or of a term of years, and making allowance for rejection and ballistic failures?—A. It will be necessary to answer your question in more detail than "yes" or "no," and if you will bear with me a minute I will try to show you how these costs are reached, so that if you do get an answer in figures to your first question you will know what it refers to and how it is done and governed. The cost accounting in this plant is worked out through nearly 40 years on a basis which we feel gives us the annual production cost of every one of

the many lines of manufacture which we produce, and to trace the cost of manufacture of armor, or any other line, it can be illustrated very briefly by saying that when an order for armor is received and cleared for manufacture an order blank is issued with the amount and number and every other vital feature of this order upon its face, and from that moment every dollar of expense that is incurred in the manufacture of that armor is charged to the order number which that blank bears, whether it be raw material for the melting of the ingot, for repairs to furnace, the locomotive engineer's time for shifting the armor plate around the works, or the carpenter's time in blocking the armor plate on the car for shipment, that order number appertains through every channel of work and operation in the plant against the direct wages and direct material that is expended. They are allotted by the auditor, the percentage of administration overhead and nonproductive overhead and every contributing cost which can not be directly charged to armor is charged up in the proportion that the productive labor has occupied (and I may say that that method of accounting is a little unfair to products whose selling prices per unit are high and in whose manufacture the amount of productive wages is low, or that that cost does not fully account for all the money which should be charged against the manufacture where the proportion of wages to selling price is low).

Now, on the contrary, where the proportion of wages to selling price is high, as is the case, for instance, in the finished gun, then that might be overloaded with overhead, whereas armor, where the wages compared to the selling price is comparatively low, is underloaded with overhead charges, and that we are attempting to correct at the present time.

Admiral STRAUSS. In making up your cost sheets on the job order do you charge in a tool rate? You spoke of the locomotive. Do you charge the time of the locomotive engineer, and the fuel, do you charge for the coal used in the locomotive?

Mr. BARBA. We charge a tool rate for the locomotive, based upon the time that the engineer is paid wages, and that locomotive tool rate comprises the cost of upkeep of the locomotive and the cost of coal, water, and every incidental charge which can not be allotted save upon the movable basis of the amount of wages paid in productive labor.

Admiral STRAUSS. Do you have tool rates for everything?

Mr. BARBA. Yes.

Admiral STRAUSS. For instance, the big planer we saw in the machine shop?

Mr. BARBA. Yes.

Admiral STRAUSS. Now, does that tool rate include something for the tools finally becoming useless?

Mr. BARBA. Not in our system of bookkeeping, because the depreciation is taken off at the end of the year, and is not taken off each tool as the day comes along.

Admiral STRAUSS. You do not include in your tool rate the depreciation of the tool?

Mr. BARBA. No; the tool rate includes not even the capital invested in the tool originally. The tool rate includes the maintenance, the helper, the proportion of the shop it occupies, the power



which is fed into the tool, and all the multitude of incidental expenses necessary to run that armor machine shop and divided amongst the tools operating to produce the product in that shop, but no interest on capital invested, and no depreciation of tool equipment is included in our tool rate.

Admiral STRAUSS. What does the auditor add for overhead? Doesn't your tool rate dispose of that?

Mr. BARBA. The tool rate is the means by which the auditor adds the overhead to the productive labor going through that tool. That is the only channel for the allotment of administration expense.

Q. What are the various components of this cost per ton?—A. Same as to first question.

Q. What is the cost per ton of the armor ingot at the forge, including all rejections?—A. Same as to first question.

Q. Give the components, with their unit prices, that enter into a furnace charge for an armor heat?—A. I will be glad to supply that later, bearing in mind that the cost of the components that enter into a charge fluctuate from day to day with the prices of raw material in the market.

Admiral STRAUSS. We understand that, of course.

Mr. BARBA. Yes.

Q. How much repair and preparation cost for the open-hearth furnace is made for each heat?—A. I will be glad to supply that later.

Q. How much does this amount to per ton of armor ingot produced?—A. I will be glad to supply that later.

Q. How much does the repair and preparation cost of the ladles amount to for each ton of ingot?—A. To be supplied.

Q. What is the fuel charge for each ton of ingot?—A. I have no means of knowing accurately enough to make a reply to that question. I can only take the amount of coal per ton which is aggregated monthly for the metal passing through a given furnace, and this might possibly cover other material than armor. In the case of the two big furnaces which we reserve for armor manufacture this would be easy to ascertain, but would not be accurate, because other furnaces are occasionally used in the manufacture of a larger ingot than one or two of these furnaces could take, and this coal computation would be inaccurate.

Q. What is the proportional laboratory superintendence charge for each ton of ingot?—A. We have never worked it out in exactly that fashion to my knowledge, but if you like I can supply that.

Q. What is the lifting, stripping, and chipping charge per ton of ingot?—A. I would have to give the same answer to that question as to the first. When you aggregate all these items you would have the production cost.

Q. What is the power charge, including steam, electric, and water, for each ton of ingot?—A. Same as to first question.

Q. What is the cost of forging?—A. Same as to first question.

Q. What scrap allowance is made for condemned ingots?—A. I will be glad to supply that.

Q. How many tons of armor ingots did your company manufacture last year?—A. I will have to get the figures to reply accurately, and will supply the answer.

Q. What was the total number of these ingots in tonnage which were rejected before reaching the forge?—A. Will supply.

Q. How many tons of ingots were forged during the past year?—A. Will supply this.

Q. How many tons were rejected during the forging?—A. Will supply this.

Q. What scrap allowance was made for these rejected during forging?—A. We will reserve answer to this question.

Q. What was the oxidization and scale loss at the forge?—A. Not known. Not computed in our cost system because we take the original weight of material charged and of ingot we produce, which we obtain by weighing the original charge and an estimate of the ingot produced therefrom; against this we apply the weight of armor in finished form which is shipped on the order, and the difference is that which is lost during all the various operations included in its manufacture, but these are not separated into losses per process.

Q. What did the labor of forging each ton of ingot amount to?—A. Same as to first question.

Q. What did the fuel for each ton of ingot forged amount to?—A. Same as to first question.

Q. What did the repairs to heating furnaces amount to for each ton of armor?—A. Same as to first question.

Q. What did the electric power, light, steam, water, drafting, transportation, and inspection per ton of plate amount to during the forging?—A. Same as to first question.

Q. Of all the ingots forged and not rejected, what percentage was discarded—how many tons?—A. Let me ask the meaning of the question, because it looks as if it would be easy to reply to that question in a way to give you useful information.

Admiral STRAUSS. For tears and cracks and things of that kind.

Mr. BARBA. I will supply the answer to this.

Q. What allowance was made for the metal thus discarded?—A. Same as to first question.

Q. What is the unit price per ton of plate when ready for carbonizing?—A. Same as to first question.

Q. How many tons of armor plate were carbonized at the works of your company last year?—A. Will supply.

Q. What was the oxidation and scale in this treatment, in tons?—A. This was covered in my answer to a previous question as to oxidation and scale loss at the forge.

Q. What was the total number of plates rejected during carbonization?—A. Will supply this answer.

Q. What does the labor per ton of carbonized plate amount to?—A. Same as to first question.

Q. What does the material per ton of carbonized plate amount to?—A. Same as to first question.

Q. How much fuel per ton of plate is used in carbonizing?—A. Same as to first question.

Q. How much did the furnace repairs per ton of carbonized plate amount to?—A. Same as to first question.

Q. What does the proportional amount of steam, electric power, lighting, drafting, inspection, laboratory, transportation, amount to per ton of carbonized plate?—A. Same as to first question.



Q. How much is the carbonized plate worth per ton without any machining?—A. Same as to first question.

Q. How many tons of armor plate were reformed by your company during the past year?—A. Will supply.

Q. How many tons of plate were rejected during the reforming process, and was any allowance for the recovered material made in working the cost of armor?—A. Will supply. There was an allowance made. The rate will not be disclosed.

Q. What does the labor per ton for reforming amount to?—A. Same as to first question.

Q. What do the repairs per ton for reforming amount to?—A. Same as to first question.

Q. What does the fuel per ton for reforming amount to?—A. Same as to first question.

Q. What is the proportional amount of power—electric, steam, water—for reforming?—A. Same as to first question.

Q. What does the proportional drafting, inspection, transportation, and laboratory for reforming amount to?—A. Same as to first question.

Q. How much discard is made after reforming?—A. This is a question very difficult to answer on short notice, because the amount of discard after reforming depends solely upon the outline of the plate that is to be shaped from the slab produced. During the process of reforming the material is almost invariably in the form of a rectangular slab out of which the outline of the plate finally shaped must be cut by discarding the portions of the rectangular slab which overhang the outline, and this varies with each plate.

Admiral STRAUSS. If you care to answer that question and you have the data on your books, I suggest that you take the output for a period or for a ship, if you please, and take the whole reformed plate and the whole delivered plate.

Mr. BARBA. I shall be glad to answer this question for a given group of armor.

Admiral STRAUSS. That would be sufficient for any one group, but you had better take the output for a ship.

Mr. BARBA. I would suggest that we take the whole contract for No. 39. That will take the work of a couple of draftsmen some little time, but we shall be glad to furnish that information.

Admiral STRAUSS. It would be very desirable for us to get that information, and if it isn't too much trouble—

Mr. BARBA (interposing). Let us disregard that; we will give it to you.

The CHAIRMAN. That is the battleship that you have already completed the armor for?

Mr. BARBA. We have just completed that armor, Senator, and we have yet to ship only the two turrets which we are manufacturing, and that is the armor which you saw in the shop this morning.

The CHAIRMAN. Therefore it is no trouble to you?

Mr. BARBA. Just the labor of getting it out; but we will do it.

Q. What allowance is made for this discard in reckoning the cost?—A. Same as to first question.

Q. What is the cost of armor per ton after reforming?—A. Same as to first question.



Q. How many tons of armor plate were sent to treatment by your company during the past year?

Mr. BARBA. Sent to treatment?

Admiral STRATTON. How much armor plate did you really treat after you had cut off your input and begun the process of manufacturing?

Mr. BARBA. We will supply that information.

Q. How many tons were lost during treatment by rejection?—A. Will consider whether or not to answer this question separately.

Q. What does the labor per ton of treated plate amount to?—A. Same as to first question.

Q. What does the material per ton of treated plate amount to?—

Mr. BARBA. Let me ask you to define that question a little more.

Admiral STRATTON. This question means how much material did you use—fire brick, clay, etc.?

Mr. BARBA. Contributory scores. Same as to first question.

Q. What do the repairs per ton of treated plate amount to?—A. Same as to first question.

Q. What does the fuel per ton of treated plate amount to?—A. Same as to first question.

Q. What do the proportional charges per ton of treated plate amount to?—A. Same as to first question.

Q. What is the total cost per ton of treated and reworked plate?—A. Same as to first question.

Q. How many tons of armor plate were sent to machining by your company last year?—A. I should like to answer that by securing the figures and inserting them.

Q. How many tons of machined plate were produced last year?—A. Will supply.

Q. Were there any rejections during the process of machining? If so, how many tons and what allowance was made for the rejected material in reckoning the final cost?—A. Will ascertain if rejections were made; if so, will supply the weight and withhold answer concerning the amount of allowance.

Q. How much per ton does the labor of machining amount to?—A. Same as to first question.

Q. How much does the machined scrap amount to?—A. This was included in the answer to a previous question in regard to discard after reworking.

Q. How much does the material for machining amount to, including oil, waste, repairing of tools, supply of tools?—A. Same as to first question.

Q. How much do the repairs per ton of machined plate amount to during the machining operation?—A. Same as to first question.

Q. What do the proportional charges per ton of machined plate amount to?—A. Same as to first question.

Q. What is the cost per ton of machined plate produced?—A. Same as to first question.

Q. How are the total water, steam, power, transportation, inspection, drafting, and laboratory charges reckoned?—A. Same as to first question.

Q. What were the total power charges for your plant last year—by power charges is meant electric power, steam power, water power, or producer gas for running engines as the case may be?—A. Same as to first question.



Q. And how did you arrive at the method of assigning the various proportions to the various operations?—A. We arrive at the method of assigning according to the answer given in some detail to a previous question regarding method of computing costs.

Q. The same information is desired for the laboratory, drafting, inspection, and transportation charges.—A. The same answer would apply.

Q. What is the cost per ton of shipped plate, class A-2?—A. Same as to first question.

Q. What is the cost per ton of class B shipped plate?—A. Same as to first question.

Q. What was the average cost per ton of class C, steel armor?—A. Same as to first question.

Q. What do you reckon your working capital to be, capital employed in production, not actually invested? For the purpose of further answering your question we have made a careful estimate as well as a careful research of previous experience. The estimate shows that approximately \$800,000 of working capital must be advanced for a contract similar to that for battleship No. 39. A careful research, excluding many assumptions, shows that experience has required approximately \$1,000,000 of outlay to finance a contract for the tonnage comprised in the contract for battleship No. 39. A. Let me ask you a question on that. Do you refer to the whole working capital of the plant?

Admiral STRAUSS. No; just to the production of armor. We are not trying to get anything else.

Mr. BARBA. It would take some little calculation to reply accurately to your question, and I have no objection to doing it. The reason I say it takes some little calculation is that the production of armor through the plant is not an average or steady performance. It is either a feast or a famine; one year we have plenty, the next year we have none, so that the capital actually employed in putting armor through the works is different from month to month, and I should require to know a little more definitely just what you would like to have to answer that question.

Admiral STRAUSS. Of course, we understand that during a 2,500-ton year, such as has just elapsed, and a full-capacity year——

Mr. BARBA (interposing). Such as we are entering upon.

Admiral STRAUSS. The difference in the working capital would be very great. But what is meant by the question is that you have to buy in advance for your output pig iron, alloys, brick, and various other things. Now, taking into consideration the fact that the Government pays you piecemeal as you produce armor, how much capital do you have to employ for a full year's output?

Mr. BARBA. If you will permit me I will reserve answer to that and figure upon the year upon which we are entering because it will be the only fair basis that can be employed because it looks like a full year's business, and we haven't had a full year's business in armor since the time of the *Oklahoma* and *Nevada*.

Admiral STRAUSS. That is comparatively recent, and it might be better to take actual figures rather than estimate on the future. For instance, you have the experience with that year and can furnish it, if you care to, rather than an estimate.



Mr. BARBA. Let the answer stand that way, and I will look up the figures in the case, and they may be of interest to you.

The CHAIRMAN. Mr. Barba, if the Government should enter upon its own armor manufacturing, where would you suggest, as an experienced manufacturer in the armor business, as the best place for it to locate its plant?

Mr. BARBA. You have asked a very important question and one which would require very considerable study of the elements that enter into the final reason for establishing an armor plant. If you were to start fresh and consider building an armor plant for the construction of simply armor for your ships, it would be necessary to include a great number of well-known factors on each of which there would be quite a number of variables, and you would then have to balance those variables to produce the best result, which would indicate the location, generally, that your plant should occupy. Were we to start now at Midvale and build a new plant and had no plant here, I should say that it would require a study covering some weeks before I could give a reasonable answer to your question because of this very fact.

The CHAIRMAN. We have letters suggesting that we should look at this place and at that place and at the other place; there is a very wide interest in this armor-manufacturing business. And the duty of this committee is to suggest whether the Government shall go into the business at all, and it would be the duty of the Navy Department to select a site, considering all the matters that you have suggested.

Mr. BARBA. You see that a comprehensive answer to your question would require a great deal of study of the elements entering into it, and a great deal of consideration of those elements, and on each of those elements you would have wide choice, so that it is almost impossible to answer generally your question except to say, somewhere near the east coast.

The CHAIRMAN. If you were handed \$10,000,000 or \$12,000,000 and told to select the best possible site for the Government or for yourself and equip it in the best possible way, up to date in every particular, where would you locate it?

Mr. BARBA. Again I must go back and say that it would require very serious consideration and much study.

The CHAIRMAN. Have you ever given any consideration at all to selling this plant to the Government as a factory?

Mr. BARBA. The matter has not been seriously proposed to us.

The CHAIRMAN. We are not authorized to seriously propose it to you, but still if we should make a suggestion to the Secretary of the Navy that the Midvale plant could be bought for such and such an amount of money as a nucleus or basis upon which to erect an armor factory, what would you say to that idea?

Mr. BARBA. Well, any proposal such as you have outlined, made seriously, would, of course, be given serious consideration. Whether the consideration would result in anything affirmative would depend wholly upon the owners of the property who were described in a previous question that you asked me, and as I have not consulted with them about the matter, I being only the man who is charged with the management of the business of the company, with the getting of the business and the selling of its product, I would not pretend to venture



an opinion upon how the owners would feel about a proposal to sell their plant to the Government.

The CHAIRMAN. Are you willing to give any information as to what you would consider the property is worth?

Mr. BARBA. This property?

The CHAIRMAN. Yes. You have already given us your capitalization.

Mr. BARBA. Yes. The property has recently been appraised, the physical appraisal which we make every once in so many years in order to check up our book inventories, and it is quite a number of millions of dollars in advance of our capital stock. Without good will, the physical value of this plant is approximately \$18,000,000.

The CHAIRMAN. Are there any things here that would be unnecessary to manufacture armor?

Mr. BARBA. Very many.

The CHAIRMAN. Suppose we left those out and simply bought the armor factory.

Mr. BARBA. It is physically impossible.

Mr. PADGETT. They are intermingled?

Mr. BARBA. You could not conduct your armor factory if you were to buy the plant you saw this morning without having a great deal of the works contributory to your very existence.

The CHAIRMAN. Well, do you believe, from your experience in the manufacture of armor, that it would be better for the Government to buy pig iron and manufacture its own steel or to buy the steel?

Mr. BARBA. Unquestionably my opinion, backed by the experience of other governments, is that the Government has no business in manufacturing a commodity which is freely offered by its own citizens. The great governments that are using armor do not manufacture it. England manufactures no armor; Russia has a small armor plant. Admiral Strauss can tell you more about it than I can, but it is our business to know something about it. Russia has a plant which is built, equipped, and run by the English armor makers; that is the way that Russia gets public utilities, by inducing a concern like Vickers-Maxim to build a plant in Russia and operate it on a long contract which is very profitable to the people who advance the money for the erection of the plant, which this Government does not do. The French built a plant some years ago, and to the best of our knowledge they have produced no armor at all that you would care to put on your ships; nothing of the present thickness required; something like 6 or 7 inches is the maximum thickness produced.

Admiral STRAUSS. Why is it that the French have failed to manufacture armor in their own shop? Why could not they succeed in manufacturing armor if they choose to do so?

Mr. BARBA. You can not get, either in France, whose political system rather nearly approaches ours, or in this country, can you get a staff or personnel to enter into the manufacture of a business like this and succeed with it under conditions such as this Government imposes upon its employees. You take the staff of the Midvale Steel Co., the men who are in charge of it and have been managing the affairs of the company; they started here as boys and have grown up with a sure tenure of office, depending upon good behavior and efficiency and ability and straight living; and we have all succeeded in drawing larger salaries than the Government pays almost any of its

employees in technical lines, and in my opinion it is impossible to expect a federal government to secure the services of such men as form the staff of the Midvale Steel Co. to-day.

The CHAIRMAN. Right there, Mr. Barba—would you mind giving this committee the scale of salaries?

Mr. BARBA. I would object to it, Senator; incidentally, Admiral Strauss would get jealous of the salaries paid.

Mr. PADGETT. In view of the statement you have made, that if you were to state the salaries that were received by the staff of the Midvale Steel Co. Admiral Strauss would get jealous, would you object to stating whether or not it is a fact that the salaries paid to the important officers of these private corporations—the Midvale Steel Co., the Bethlehem Steel Co., and the Carnegie Steel Co.—are very much higher than the salaries paid to the higher officers in the Navy?

Mr. BARBA. Yes, Mr. Padgett; the salaries paid are higher than are paid to your bureau chiefs, and these salaries are paid to put these particular staff officers on piece work, to spur them exactly as a man with a pick and shovel is spurred to his very best endeavor.

Mr. PADGETT. In other words, you get a higher salary as a base salary and then you participate in the profits?

Mr. BARBA. That has not been the plan of this company, but we hope that it will become so, because our owners firmly believe in the principle of cooperation, and they are trending very strongly toward enabling every workman, at least in a leading position, to participate in the profit of this company.

Mr. PADGETT. That is the policy pursued by the Bethlehem Steel Co., so the president told me. The thing I want to get at was this, that the salaries paid, without stating what they are—the salaries paid to these principal officers are much higher than the salaries paid to a rear admiral in the Navy?

Mr. BARBA. We have a few men whose salaries are higher than those paid to a rear admiral in the Navy.

Q. What does the maintenance of your plant amount to per annum?—A. Same as to first question.

Q. Is this amount over and above the repairs which have been charged to the various operations comprising the total manufacture and separate from depreciation?—A. I think I will say “same as to first question” on that, but it is open to some discussion.

Q. What is the total of proportional administration charges made to armor; how has this been arrived at?—A. Same as to first question.

Q. Give a tabulated list showing the various salaries paid, and how proportionately divided, so as to include the armor plant.—A. Same as to first question.

Q. How much did the insurance charges on the armor plant amount to?—A. Same as to first question.

Q. How much taxes are chargeable to the armor plant?—A. Same as to first question.

Q. How much do you charge to armor in behalf of the pension fund and liability fund? That is, if you have the pension fund you must have liabilities for injuries.—A. Same as to first question. We handle our pensions and liabilities in a way that is a little bit peculiar and is not charged into the running cost of the plant. It is charged out of profit and loss at the end of the year in one lump sum.



Mr. PADGETT. You do use that element in fixing your selling price of armor? I understand that you use this as one of the component elements in fixing your selling price?

Mr. BARBA. With reference to the pensions, etc., we prefer to consider that the owners carry that as their own personal charge. In other words, it comes out of the money which is available for distribution and has no particular rate of charge against any portion of the plant.

Admiral STRAUSS. You mean it is a gratuity?

Mr. BARBA. It is put on a different basis than it will be in the future, when the workman's compensation act becomes effective. The next legislature in Pennsylvania will have a workman's compensation act; it is one of the most advanced workman's compensation acts that has been produced, and we strongly supported the one that was before the last legislature. It is right that the trade should pay for its casualties, and we shall strongly support the bill.

Q. How much depreciation is charged against the armor plant; what is this depreciation; how has it been arrived at?—A. Same as to first question.

Q. After a year's operations, within which a certain sum of money has been set aside from the proceeds of the manufacture of armor for depreciation charge, what is done with this money?—A. Same as to first question.

Q. How much money is invested in your armor plant?—A. Approximately \$5,000,000.

Q. Does this represent the total amount which has been expended for this plant, inclusive of all depreciation replacements?—A. I would like to reserve an accurate answer to this question, and may reply to it fully. [Further answer to question.] In further answer to your question asking whether amount expended for plant is inclusive of all depreciation and replacements, we beg to state that my answer to question 60 exhibits the figures of cost of plant and states that this is the book value of the plant to-day, after all depreciation has been written off to date, and that the cost of reproduction of the existing plant would, therefore, necessarily be much higher than this stated book value.

Q. In reckoning your profit, is it reckoned as a profit on the total amount of money which has been put into the armor plant, or on the amount which has been put into the armor plant less all depreciation which has not been used for the purpose of replacement?—A. I have already made an answer to this question, but in answering it in its present form I repeat that depreciation is taken out of the profits exactly as is interest on the capital invested taken out of the profits, both of them being fairly comparable to interest on capital and to the body of the capital account with respect to depreciation.

Q. What is the capacity of the company's armor plant in tons per year?—A. For cemented armor I would estimate that a full year's output would be 6,000 tons.

Q. When you state that you have \$5,000,000 invested in the production of armor, do you include the cost of the site in that sum?—A. Yes; the land is included.

Q. How many acres are now occupied by your plant?

Mr. BARBA. Do you mean the armor plant?

Admiral STRAUSS. Yes. Of course, your answer must be approximate.

Mr. BARBA. I shall have to consider that because the land occupied by the buildings in which armor alone is produced in no sense represents the amount of land occupied by the portion of the plant that contributes to the operation.

Mr. PADGETT. You stated that you had \$5,000,000 invested in your armor plant; you then stated that it included the cost of the land. Now, then, the land that is included in that estimate of investment would be the land that would go into it. You can state that, I presume?

Mr. BARBA. Yes.

The CHAIRMAN. How much is land and how much is invested in other things?

Mr. PADGETT. I would thank you to separate these items.

Mr. BARBA. I will try to do that. [Further answer to question.] Referring again to the figures answering questions 60 and 222, we note that you ask "How much of this figure is land and how much is invested in other things?" We have taken the land comprised in the figure covering the book cost of our armor plant at \$125,000, nominally 15 acres and which is far below the figure at which similar land could be purchased to-day.

Admiral STRAUSS. One more question: What percentage of finished armor did you produce from the cast ingot?

Mr. BARBA. I can answer that question only in the aggregate by taking the last armor for No. 38, the *Pennsylvania*, in which we used approximately 15,000,000 pounds of ingots and shipped just under 5,000,000 pounds of plate.

Admiral STRAUSS. Something like 33 per cent?

Mr. BARBA. The actual shipment being 4,952,000 pounds, I think, so that the amount of finished plate for the *Pennsylvania* contract was almost exactly one-third of the weight of ingots originally used.

Admiral STRAUSS. Originally cast?

Mr. BARBA. Yes.

Mr. PADGETT. Now, then, what is the relative weight of the original ingot cast compared with the weight of the original charge that went into the furnace—the pig iron, the metal, the raw material?

Mr. BARBA. I shall be glad to get that information for you fairly accurately, but it will approximate 10 per cent more for the aggregate weight of raw material charged over the weight of the ingot produced.

Mr. PADGETT. Then the weight of the finished product is less than 33 per cent of the original raw materials that went into the furnace?

Mr. BARBA. Yes, sir; and the reason is, of course, that there are losses within the furnace of the material charged.

Mr. PADGETT. That is what I wanted to get at, and I understand that approximates 10 per cent.

Mr. BARBA. That, roughly, is 10 per cent.

Mr. PADGETT. I would like for you to put that in.

Mr. BARBA. Your pig contains 2 per cent of silicon and 3 per cent of carbon, and there is 5 per cent of your pig iron that does not produce ingots; that goes into the slag, and so with many of these elements. [Further answer.] An examination of the records has found that instead of 110 per cent the figure should be approximately 115



per cent for the amount of material charged to produce 100 per cent of ingots.

Mr. PADGETT. In connection with that same question, you have this 60 per cent that represents the scrap that comes off of your ingot over and above your 30 per cent of finished product; that constitutes scrap to go back into your furnace for another ingot, doesn't it?

Mr. BARBA. Yes.

Mr. PADGETT. What is the proportionate or relative value of that material, as scrap, compared with the original material of pig iron and all the other elements that go in originally?

Mr. BARBA. I will answer that question generally and not specifically by stating that the value of this scrap is less than the value of the original raw materials for the reason that it is of so special a chemical composition that it is more costly to melt down this scrap for use in future ingots than it is to take the equivalent of this scrap in new materials, to the extent that it would require five or six hours to melt a charge of new materials, whereas it would require all the way from 10 to 14 hours, depending on the proportions used, of time to melt a charge made up of remelted scrap.

Mr. PADGETT. I will ask you to state what it is in this remelted scrap that causes this harder process of melting.

Mr. BARBA. It is the high percentage or content of chromium. The chromium is necessary to manufacture armor plate to stand the present specifications. The armor plate mixture to-day is generally a chrome-nickel mixture. The chromium is approximately 2 per cent of the whole weight of the finished armor plate. This chromium, when introduced back in the furnace in the form of scrap, greatly retards the melting of the scrap. It oxidizes and forms a very poisonous (that is the term the men use) slag in the furnace, requiring considerable treatment with fluxes and other medicines to correct the poison, and in the act of melting down requires at least twice the time that scrap not containing chromium requires to be melted. In the original production of armor plate metal the chromium is not present until 20 minutes before the material is ready to be taken from the furnace in finished form; so that when you try to remelt your scrap we must contend with the presence of chromium in that scrap.

Mr. PADGETT. Now on that point. Is the chromium burned out and wasted, or does it chemically form with, and remain with, the metal in its remelted form?

Mr. BARBA. You start with about 2 per cent of chromium in your scrap, and use varying proportions of scrap according to the daily varying conditions of the furnace, so that the figures are really the subject of calculation for each case, but to instance a case, start with 2 per cent chromium in the scrap. When the charge is melted the chromium will have been reduced to about 1 per cent; then in the further operation of pouring and treating the steel the chromium will be reduced in an armor-plate furnace to about one-quarter of 1 per cent, all of it going into the slag in the form of oxide of chromium and forming a dry or poisonous slag which, as before stated, requires very careful treatment to make a successful operation.

Mr. PADGETT. Suppose you were to use one-half scrap and one-half of original pig iron. Would this chromium combine with the pig iron or would it go into the slag?

Mr. BARBA. It would first combine with the pig iron and ultimately go into the slag in exactly the same proportions as indicated in the last answer.

The CHAIRMAN. These details of manufacture are not essential to our investigation, and I have a question to ask which is very essential, I think. Mr. Barba, one of the elements of cost of armor plate now is in the security of the armor manufacturers as to contract. You do not know what you are going to get next year. There is no certainty about the business.

Mr. BARBA. That is one of the very vital elements, and in the past years we have taken our medicine.

The CHAIRMAN. Suppose the Government, having had to pay for this uncertainty, should determine to change its policy and should endeavor to get at the actual cost of armor plate for itself, with a view of entering into contracts for a fixed number of years, say, 10 years. If the Government should approach you and offer you work enough to keep your factory busy on armor plate according to the Government specifications for the next 10 years, what reduction would you make from the present prices you are charging?

Mr. BARBA. You asked a question that became very interesting until your last clause, because if the Midvale Steel Co. were offered a continuous performance in the production of armor plate you would get a reduction under the present price unquestionably, because the whole manufacturing could be systematized to a degree which has not been possible in the past, and the Government would, and properly should, be the gainer by such a condition, but as to the amount of reduction under the present price, if I would, I could not answer that question accurately, because it is impossible to judge what would be the condition under such circumstances.

The CHAIRMAN. If the Government should go into partnership with Midvale, would you open your books and institute a system of book-keeping which would arrive at the actual cost of armor? Would you be willing to enter into contract whereby you would be guaranteed against loss?

Mr. BARBA. You have asked a question which I must open up a little. Do I understand you to mean that were the Government to come to Midvale and enter into partnership with us for 10 years and say, "We will guarantee you so much armor a year, or failing to give you that armor we will see that your profits are the same," or offer some contract similar to that, we would.

The CHAIRMAN. You would?

Mr. BARBA. Certainly.

The CHAIRMAN. Of course, this is all an excursion into the field of possibilities, you know, as to what the Government will do, because Congress orders the Secretary of the Navy to do what he does do, and he can not do it without the appropriation. So I am only asking this question in order to arrive, if I possibly can, at the conclusion which I have firmly fixed in my own mind, that in order for the Government to be fortified against robbery which I believe it has suffered in the past, it is necessary that the Government should build its own armor plant.

Mr. BARBA. You commenced a question in which I was getting very much interested at once because what you were proposing is practically what England has done with her armor makers.



The CHAIRMAN. And Germany with Krupps?

Mr. BARBA. Germany with Krupps is another story. They practically own Krupps; they can dictate exactly what they are to do with Krupps. That is belief without any sure knowledge, of course.

Mr. PADGETT. Putting the Senator's question in concrete form, if the Government should establish a policy of continuing contracts in armor, as is done in "rivers and harbors" improvements, and should say to you, we will make a contract for 100,000 tons of armor, to be delivered during the next 10 years, divided and apportioned among 10 years, would the manufacturers of armor be justified and would they, in fact, give a substantial reduction in the price of armor below the present prices?

Mr. BARBA. Speaking for this company, you could count on a substantial reduction in the price of armor under such conditions as those because those conditions are most attractive and they are conditions which are the exact opposite of our 10 years' experience; such conditions make a very attractive picture for the future. We would agree with the Government on a price and terms and amounts, and we would have an assurance of business which would reduce the armor business from almost an act of God to an everyday commercial proposition, where it deserves to be.

Mr. PADGETT. I know that Congress is pursuing such a policy with regard to the improvement of rivers and harbors. They authorize a certain amount and then they appropriate from year to year as the work is done, and it just occurred to me that if Congress would pursue a policy of that kind, whether the armor makers would be prepared to offer a reduction so substantial in character as to make it inviting for the Government to pursue that policy instead of the one we have now, of year by year.

Mr. BARBA. That is the way the business should really be conducted, unquestionably. Whether or not you could reduce it to the concrete terms of 100,000 tons in 10 years is a question that is not before the present inquiry.

Mr. PADGETT. Oh, certainly, but I am just speaking of a policy along that line.

The CHAIRMAN. The idea was this: The present exorbitant prices we are paying are due entirely to the uncertainty of the manufacturers, are they not?

Mr. BARBA. The present exorbitant prices, as you term them, are—I must deny your premises because I must deny that they are exorbitant——

The CHAIRMAN (interposing). We won't discuss that phase of it.

Mr. BARBA. Senator Tillman, I would like to state with equal force and authority with yourself and necessarily with much more intimate knowledge of the subject, that the prices that the Government is paying for armor are not high and exorbitant prices. I am trying to tell you something of that sort now. You had a practically fixed policy of two ships a year for quite some time in Congress, and Congress almost legislated the price of armor. If you go back through the records you will find that is practically so, and the price of armor reached a point of \$420 per ton under a policy which gave them the armor for two ships a year, and the practice of the department was to distribute that armor into equal thirds, as this memorandum shows, irrespective of any price they got; but that is beside the point;

the point was that they had practically a definite amount of armor for two ships.

The CHAIRMAN. Let us go back there a minute. When Midvale first bid on armor and got the contract, and then President Roosevelt arbitrarily divided it with Carnegie and Bethlehem, was Midvale prepared to manufacture all the contract?

Mr. BARBA. They were willing at that time to accept the whole 16,000 tons. Probably, though, the requirement for speedy delivery of armor was not the same as it is to-day, and we might have been able to get away with the whole contract at that time. I am free to say that to-day we would not, because the shipbuilders have been spurred up to a rate of delivery which makes it necessary for Admiral Strauss at this time, for the armor for the three ships just let, to specify a rate of delivery which will give the shipbuilders no inconvenience such as he has had in the past. One of the most laudable arrangements that has been put into effect is that schedule of delivery by construction groups, and when it was presented to us in June this company jumped at it, as the thing to be helped and supported. Now, had we, at this time been given a contract for the armor of two ships, say 17,000 tons, this company, with its present equipment, could in no sense manufacture the armor at the present time at the rate which Admiral Strauss requires it, if we had more than the armor for one ship. It is going to be nearly all we can do to get the armor for one ship in the time specified. The time he has specified is much shorter than he would have specified 10 years ago. However, 10 years ago we would have been glad to have experimented and gotten it out somewhere nearly in the time required.

The CHAIRMAN. At \$399 a ton?

Mr. BARBA. Yes, sir.

Mr. PADGETT. Isn't it a fact that the action of President Roosevelt, in declining to award the contract to the Midvale people, they being substantially the lowest bidders, and arbitrarily giving two-thirds of it to the others, was not the effect of that to destroy any competition with the bidders, and have they not since then put in substantially identical bids, because they knew that the Government would divide it, irrespective of the bids?

Mr. BARBA. That is essentially true, but the process was a long one; in 1900 Midvale bid, and was thrown out.

Mr. PADGETT. What was the bid of the Midvale Co. in that year when its bid was thrown out?

Mr. BARBA. It was a sliding-scale bid, according to the tonnage.

Lieut. Commander BLOCH. It was \$445 a ton for class A and \$400 a ton for class B. Those terms do not mean the same as they do to-day.

Mr. BARBA. In 1903 Midvale was a second time the lowest bidder, and received a little over one-third of the order.

Mr. PADGETT. And that was the year that you had a plant?

Mr. BARBA. Yes. In 1905 Midvale was a third time the lowest bidder, and was given 1,000 tons out of 8,000 tons. In 1906 Midvale was a fourth time the lowest bidder, and received 3,660 tons out of 7,319 tons.

Mr. PADGETT. That is the time that the split came.

Mr. BARBA. No, the time before, in fact both times before. This is the third time that we had a split.



Mr. PADGETT. The time I am talking about is the time when the administration divided the contract. Since then they have been giving identical bids, have they not?

Mr. BARBA. In 1907 Midvale was a fifth time the lowest bidder, and bid \$410 against Carnegie and Bethlehem bids of \$420, and they had the royalty.

The CHAIRMAN. What do you mean by royalty?

Mr. BARBA. The Government paid an additional royalty of \$33.60 on class A and \$11.20 on class B per ton on the Krupp patents.

Admiral STRAUSS. Which these other two companies were subject to.

Mr. BARBA. And we were not subject to. Right there is an interesting fact. Immediately after the letting of one-third of that contract to Midvale, three suits were brought against Midvale alleging infringement of the Krupp cementing patents and treatment patents. These suits we fought up to the Supreme Court and won in every court. Immediately after the first judgment was rendered both Carnegie and Bethlehem were notified by the Government, who had paid this royalty as an extra charge over and above the bid price of armor—

Mr. PADGETT (interposing). The bid price was \$420?

Mr. BARBA. Plus \$33.60 a ton. The Government notified them that they would no longer pay any royalty, because if Midvale did not exact a royalty and had gotten a judgment, the Government need not pay, and Midvale was fighting that suit through all the courts and winning it in the courts, and the Government has saved \$33.60 per ton for all the armor they bought since.

Mr. PADGETT. Not up to date?

Mr. BARBA. Up to the expiration of the patents.

The CHAIRMAN. But for Midvale's public spirit and unwillingness to be robbed by Krupp's patents, the Government would be paying a royalty now?

Mr. BARBA. The patents have expired.

The CHAIRMAN. When did they expire?

Mr. BARBA. I will supply that data later. [Further answer to question:] I attach a table of the four patents and the expiration dates for the American patents and for the German patents; in effect the expiration is at the dates of the German patents.

No.	Date.	Expiration.	
		American.	German.
Krupp patents:			
534178.....	Feb. 12, 1895	Feb. 12, 1912	Dec. 16, 1906
642926.....	Feb. 6, 1900	Feb. 6, 1917	Feb. 28, 1907
651965.....	June 19, 1900	June 19, 1917	Apr. 23, 1909
653413.....	July 10, 1900	July 10, 1917	.....do.....

Then, again, in November, 1908, Midvale was a sixth time the lowest bidder and was awarded one-third of the tonnage.

Mr. PADGETT. Could the Midvale Co. have undertaken more than it received?

Mr. BARBA. At that time, yes; because it was not anything like its capacity.

The CHAIRMAN. Mr. Padgett, it seems that all the testimony brought out demonstrates clearly that the Government had forced this combination of manufacturers; not only encouraged it, but compelled it.

Mr. PADGETT. That is what I am bringing out. The policy that was pursued by Roosevelt, in refusing to give the award to the lowest bidders, finally brought about a condition where there were no lowest bidders. Didn't the three concerns in their letters to Secretary Daniels, last year, practically state to him that the reason for identical bids was because of the policy hitherto pursued by the Government in declining to respect the lowest bids?

Mr. BARBA. Yes, sir; and immediately after the year of 1907 that I spoke of here, the policy was adopted of dividing the armor into equal thirds by the department and reducing the price of the bidders to the price bid by the low man.

The CHAIRMAN. Therefore, you got behind the curtain and said, What is the use of bidding below each other; let us combine?

Mr. BARBA. That price was simply maintained. It was \$420 plus royalty, and after the royalty was knocked off \$420 was the price from that day until the last year, when the eight-hour law advanced the price from \$420 to \$454, which this year was reduced from \$454 to \$440 and for next year to \$425, again an official basis, because the contracts for next year, at Secretary Daniels's request, were all placed at the price of the lowest bidder. I would like, Senator, to have this prepared statement incorporated it in the hearing.

The CHAIRMAN. You can incorporate in the hearing.

Mr. PADGETT. I will ask you to state if you have prepared and have with you a statement giving the history of the manufacture of armor; and, if so, will you attach that statement to your hearings as an answer to this question?

Mr. BARBA. I have such a statement prepared and shall be glad to let it stand as a fuller answer to some of these questions. Incidentally, if you will allow me to add——

Mr. PADGETT. You can add anything you want to.

Mr. BARBA. I want to put it in a little better shape.

Mr. PADGETT. You can put it into better shape and then insert it in your hearings.

The CHAIRMAN. You see we want a perfectly full and square explanation of this whole armor contract business, the cost of manufacture, and everything about it. We are very sorry we have not been able to get you to act throughout as your instincts must lead you to do, for we are certainly impressed with the belief that you are an honorable gentleman and would tell us more than you have but for the idea you have along with the other armor manufacturers that you must keep your secrets to yourself. In effect you are all telling the Government, "You have no business to go into armor manufacture at all, because we will make the armor, and are already making it at a reasonable price." If your company would compete instead of combining, as I believe you have combined, the Government would not need to erect an armor plant at all. But we believe you are in a combination to charge the Government an excessive price, and that is our trouble.



## STATEMENT OF MR. WILLIAM P. BARBA.

## THE ARMOR CONTRACTS OF THE MIDVALE STEEL CO. AND DATA RELATING TO ARMOR.

The Midvale Steel Co., of Philadelphia, made its initial bid for an armor contract on August 10, 1900. (See Appendix A for data regarding company.) (Note by Committee—The Committee is informed that on this date the Midvale Company had no armor plant.)

The United States Navy Department opened on that date bids for about 36,000 tons of armor. Midvale bid, net (no royalties demanded), \$438 per ton; the Carnegie and Bethlehem Steel companies bid, net (including royalties), \$490 for class "A" armor. Midvale received no award. (See Appendix B for details.)

In October, 1903, Midvale was a second time the lowest bidder (\$398 per ton, net, was bid on class A as against \$453.60, net, by Carnegie and Bethlehem), on about 16,000 tons of armor. Midvale received a little over one-third of the order. (See Appendix C for details.)

In January, 1905, Midvale was a third time the lowest, bidding \$398 net for class A against the Carnegie and Bethlehem bids of \$453.60, net. A contingent order for 1,000 tons out of 8,000 tons was all Midvale received. (See Appendix D.)

In July, 1906, Midvale was a fourth time the lowest bidder, and received 3,660 tons out of 7,319 tons. Midvale bid for class A armor \$346, and Carnegie and Bethlehem \$381 per ton. (See Appendix E.)

In the summer of 1907 Midvale was a fifth time the lowest, bidding \$410 per ton, as against the Carnegie and Bethlehem bids of \$420 for class A armor. (See Appendix F, containing important Government letter and details.)

To restrain the Midvale Co. from proceeding with its manufacture of armor, in 1907 three suits were brought against it in the name of Fred. Krupp, Aktien-Gesellschaft. Although these suits were bitterly fought, they were lost in every court. The Supreme Court of the United States also deciding in favor of the Midvale Steel Co. (See Appendix G.)

On November 9, 1908, Midvale was a sixth time the lowest bidder on the total amount of armor of all classes for the *Utah* and *Florida*. Midvale was awarded one-third of the tonnage required. (See Appendix H.)

On August 18, 1909, bids for the armor for the *Arkansas* and *Wyoming* were opened. Midvale was slightly lower on the total of all classes. (See Appendix I.)

On October 7, 1910, the armor makers were invited to a conference by the Government on account of the increasing difficulties and expense in the manufacture of armor. (Appendix J.)

On December 1, 1910, the bids for the armor for the *Texas* and *New York* were opened. Each manufacturer received practically one-third of the order for the *Texas* armor. (See Appendix K.)

On November 16, 1911, the Government invited the armor makers to a conference in reference to the armor for the *Oklahoma* and *Nevada*.

On January 4, 1912, bids were opened for the *Oklahoma* and *Nevada* armor. The amount was divided into thirds as nearly as possible. (See Appendix L.)

On December 18, 1912, the Government invited the armor makers to a conference in reference to the armor for the *Pennsylvania*.

Bids for the *Pennsylvania* armor were opened February 18, 1913. Midvale made the best bid on every class of armor, and received one-third of the total. (See Appendix M.)

The armor bids for battleship *No. 39* were opened August 27, 1913. The Secretary of the Navy had new bids submitted on October 14, 1913, and awarded the whole of the contract to Midvale. (See Appendix N.)

On October 15, 1914, bids were opened by the Secretary of the Navy for approximately 25,000 tons of armor for battleships 40, 41, and 42, at which time Midvale's bid was the lowest on all classes, except class A, on which class we were underbid by the Bethlehem Steel Co., the prices which Midvale bid being for class A armor, \$436 per ton; for class A-2 armor, \$486 per ton; for class B armor, \$466 per ton; and for class C armor (bolts), \$376 per ton. (Note by Committee—The Midvale Company only bid for one-third of the armor advertised for. The prices at which awards were subsequently made were as follows: Class A, \$425 per ton; Class A2, \$486 per ton; Class B, \$466 per ton; Class C, \$376 per ton.)

On October 19, at the invitation of the Secretary of the Navy, the armor makers were called into a conference in the office of the Secretary and told that the prices they had quoted for armor were too high, and were asked the question why, if \$440 per ton was the price for the armor for battleship 39, when but 8,500 tons of armor was purchased, the price for 25,000 tons of armor should be reduced only to \$436 per ton? Midvale's answer to the Secretary was to the effect that the price for armor had practically been



established by the department on a basis of not less than two ships per year; and when but two ships were ordered in between two and three years, we felt that this was but a temporary condition, and that, although the price for armor for the reduced quantity should be somewhat increased, yet Midvale did not bid an increased price that would be commensurate with the reduced tonnage to be passed through the mills. In commenting upon this point Secretary Daniels stated that if for the armor for battleship 39 such an increase had been proposed he certainly would have opposed it.

Upon the solicitation of Secretary Daniels the armor makers assembled in his office on October 19 were asked to meet again in his office on October 26 and submit new bids.

On October 26 all three armor makers were represented in the office of the Secretary, Admiral Strauss being present, together with the Secretary, and Midvale handed the Secretary a letter, reducing its price to a figure which was not disclosed at this meeting, but which was \$427 per ton for Class A armor, the originally quoted prices being maintained for the other classes of armor. On November 2 the Midvale Steel Co. received from the Secretary of the Navy a letter offering them the armor for one ship (the quantity for which they had bid), at \$425 per ton for Class A-1, as against the revised price of \$427 per ton, equaling the price offered him by the Bethlehem Steel Co., which proposition of the Secretary's was accepted by the Midvale Steel Co.

Midvale was thereupon notified of an award of the armor required for one ship, under the terms of its original proposal, as modified on October 26 and the Secretary's letter of November 2.

In 1906 the Midvale Steel Co. made a bid of lire 2,325 (\$455.70) (lire=19.6 cents) per ton for 2,100 tons of armor for the Italian Government, and were awarded the contract. (See Appendix O.)

The Midvale Steel Co. commenced the manufacture of armor late in 1903, and has been in no way a party to the several investigations made by congressional committees.

The reasons for the great increase in the cost of manufacturing armor are discussed in Appendix P. It will be noted that the armor investigated by the Armor Factory Board in 1897 was a very much easier manufacturing proposition than the armor demanded by modern requirements and that almost each year in the last decade has added to the difficulties, risk, and expense of production.

The eight-hour law adds greatly to the expenses of the American manufacturer. Such a condition imposed upon us and not upon the foreign corporations who are asked to compete for the work for our Navy, whether armor or other material, makes the competition most unfair to the American, both workman and employer, when the contracts are let abroad. England, Germany, and France have refused to purchase armor, guns, or forgings intended for their respective navies unless of domestic manufacture. This stand is taken for military as well as patriotic and economic reasons. No wise Government will be blind to the military necessity of having within its borders suitable well-equipped ordnance works whose services are not dependent upon the will of some foreign power. Moreover, the European taxpayer will not consent to see his money go into the pockets of foreign workmen in a foreign country, but insists that money raised by taxation be used to give work and prosperity to his own country.

The Midvale Steel Co. has had a long and serious struggle to establish itself in the manufacture of armor and has spared neither trouble nor expense in the development of its processes of manufacture. Many hundreds of thousands of dollars spent in experiments and investigations and years of patient scientific research are the means by which "Midvale" has been able to successfully manufacture armor and meet and overcome the constantly increasing difficulties. This knowledge and experience have been quite as costly and are as much the property of the company as some of its other and more material assets.

#### APPENDIX A.

##### INCREASE IN NUMBER OF MEN AND WAGES IN THE WORKS OF THE MIDVALE STEEL CO.

Total wages from Jan. 1 to Sept. 1, 1903.....	\$1, 322, 488. 96
Average number of men working per day.....	3, 017
Average wages per day per man.....	\$2. 07+
Total wages from Jan. 1 to Sept. 1, 1913.....	\$2, 635, 058. 75
Average number of men working per day.....	4, 860
Average wages per day per man.....	\$2. 60+
Average increase in wages per day per man in 10 years....per cent..	25. 6
Increase in number of men from 1903 to 1913.....do....	61
Increase in pay roll from 1903 to 1913.....do....	99. 3



Referring to the difference in wages paid for certain trades in England and the United States, as given in Cost of Living in American Towns, Senate Document No. 22, Sixty-second Congress, a report of an inquiry by the Board of Trade of London, beg to submit the following:

The only comparison made in the above report comes under the head of—

*Engineering trades.*

	Wages per week.	
	England.	United States.
Fitters.....	\$8.64	\$17.88
Turners.....	8.64	17.88
Smiths.....	8.64	20.48
Pattern makers.....	9.12	22.00
Laborers.....	5.28	10.50
Average per man per week.....	5)40.32 8.064	5)88.74 17.748

From the above it will be seen that the rate of wages paid, coming under engineering trades, is 120 per cent higher in this country than in England.

APPENDIX B.

APPEAL OF THE MIDVALE STEEL CO. IN THE MATTER OF THE REJECTION AUG. 11, 1900,  
OF ITS BID FOR ARMOR.

To the honorable JOHN D. LONG,  
*Secretary of the Navy.*

The Midvale Steel Co. of Philadelphia, Pa., respectfully states the following facts as the basis of an appeal which said company hereby prays from the decision rendered by the Hon. Frank W. Hackett, Acting Secretary of the Navy, made in the Navy Department on the 11th day of August, 1900, in the matter of bids for armor plate which were opened on August 10, 1900. The decision rejected all bids.

The Navy Department made proposals for bids for armor plate, a copy of which is hereto attached marked "Exhibit A."

The Carnegie Steel Co. bid on the Department's proposals, as shown in the schedule, marked "Exhibit B," hereto attached, and also submitted a letter, constituting part of its bid, copy of which letter is hereto attached, marked "Exhibit C."

The Bethlehem Steel Co. bid on the department's proposals, as shown by the schedule marked "Exhibit B," and also submitted a letter constituting part of its bid, copy of which letter is hereto attached, marked "Exhibit D."

It will be noticed that the bids of these two companies were in identical figures, each bidding for one-half of the armor to be contracted for. These two companies have heretofore been manufacturing armor plate for the Government, and each has its plant ready prepared for the manufacture of this material. The time within which each of these two companies in its bid proposed to begin deliveries was six months after the signing of the contract, the armor to be delivered in each case at the rate of 300 tons per month.

Your petitioner, the Midvale Steel Co., the only other bidder for armor, has not a plant that would enable it to manufacture now such armor as is required, but it has large steel works, and has heretofore been doing, and is now doing, a large business in the manufacture of steel forms of various kinds. Its proprietors, understanding that the Government desired to procure competition in the manufacture of armor, made a careful examination of the subject matter, including calculations of the cost of erecting a proper plant, and the time within which the same could be done, and said company having prepared itself in all respects to enter the field as a competitor of the two aforesaid companies for the manufacture of armor, submitted its bids as shown in the schedule marked "Exhibit B," together with a letter as part thereof, a copy of which letter, marked "Exhibit E," is hereto attached. Petitioner offered to begin deliveries within 26 months and to deliver thereafter at the rate of 500 tons per month.

Petitioner's bid was, as it understands, in all respects formal and complete and accompanied by a certified check for the amount required of bidders, and petitioner

is prepared in all respects to show, if it should be required, that it is competent to comply with its said offer and bid in every respect. This, however, petitioner assumes may be taken for granted, as the action of the Acting Secretary of the Navy, hereinafter adverted to, was not based upon any objection to the formality of petitioner's bid, or the ability of petitioner to comply therewith. Petitioner further states that none of the armor bid for by it, except that for the *Maine* class, hereinafter mentioned, will be needed before the time when petitioner offered to begin deliveries.

The amounts of money involved in these biddings were very great, figuring up, according to the prices heretofore demanded of the Government for such armor as was required in this case, a very large sum total, to wit, over eighteen millions of dollars; and at the reduced prices bid by your petitioner, figuring up over fifteen millions of dollars.

It was known to the representatives of both the Carnegie Co. and the Bethlehem Co., before the biddings in this case, that petitioner would also put in a bid, and it was also known to the gentlemen that petitioner was not prepared with a plant, and was not therefore able to agree now to furnish a certain part of the armor wanted by the Government, to wit, the armor for ships of the *Maine* class (about 7,200 tons), at the time when such armor would be needed, it being understood that some of the armor for the vessels of this class would be wanted within about 12 months from the date of the bidding. The Carnegie and Bethlehem companies, therefore, as to the armor for this *Maine* class of vessels, possessed an advantage which was well known the Midvale Steel Co. could not overcome. If these two companies should, therefore, by concert with each other, agree to bid and should bid, each of them for one-half of all the armor contained in the proposals of the department, and if each should make it a condition that its bid was not binding unless such company should obtain practically one-half of all the armor desired by the Government, it would be plainly impossible for the Midvale Steel Co. to become a competitor, unless the Government should agree to let the Midvale Co. have such portion of the armor as it could undertake to furnish within the time needed. Petitioner would be excluded from bidding for the whole amount of armor mentioned in the proposal of the Government, because it would be impossible for it to erect the large and costly necessary plant and put it into operation within less than two years and two months. Petitioner's estimate of time necessary for the erection of such plant was and is 26 months.

This being the situation, these two companies, the Carnegie and Bethlehem, each made it a condition of its bid that it should obtain practically one-half of the armor. If, then, the Government should be unwilling to extend the time to two years and two months for the beginning of the deliveries of armor for the *Maine* class, it was plainly impossible that the bid of the Midvale Co. for the whole of the armor in classes A and B could be accepted; and if the department, after opening all the bids, should reject them all, including all those of the Midvale Co., which were much the lowest, the net result of this first bidding would be that the two old companies heretofore engaged in the manufacture of armor would have gained information as to the prices at which their proposed new competitor was willing to manufacture in competition with them and would now, having each of them a plant, and thus an advantage of, say, \$4,000,000, be in a condition to shut petitioner out in future lettings and prevent the department securing a competitor with them for the manufacture of armor. Petitioner of course saw, before it made its bids, that the Carnegie and Bethlehem companies would probably attempt, by attaching to their bids such conditions, to exclude the bid or bids of petitioner from being considered by the department. Petitioner therefore did not confine itself to bidding for the whole amount of armor, but it submitted separate bids, giving the prices at which it would manufacture each of the several quantities of armor in classes A and B, as mentioned in the Government's proposals, including also bolts and nuts, as will appear from its bid herewith submitted.

Petitioner so put in its bids because, according to the circular accompanying the department's proposals for armor, the department would have the right to accept or reject, so far as it was concerned, any and every part of any bid. Petitioner had hoped to be awarded at least some large portion of the armor in question, because it would be able to furnish any and all of the armor called for within the required time except the 7,200 tons needed for the ships of the *Maine* class.

Under petitioner's bid and the provisions of the department's circular, heretofore referred to, the department might have awarded petitioner about 24,000 tons of armor of class A and about 3,500 tons of armor of class B, all of which would have been exclusive of the armor for the *Maine* class. Petitioner's bid was substantially and greatly lower than the bids of the other two companies, and if the above-named amount of armor, to wit, 24,000 tons of class A and 3,500 tons of class B, had been awarded petitioner, the Government would have saved \$1,470,000, as compared with the prices at which the two old companies agreed to take the armor of these two classes.



Again, the department might have awarded to the Midvale Steel Co. 20,000 tons of class A, for which it had put in a separate straight bid, and by so doing the saving to the Government on this amount of armor over the prices asked by the two old companies would have been \$960,000. The delivery of this armor petitioner offered to complete within 40 months after the beginning. The Carnegie and Bethlehem companies offered to complete their deliveries of less amounts within 50 months after beginning. Had either of these two awards, to wit, of 20,000 tons or of 27,500, been made to the Midvale Co., the Government might have readvertised as to the armor not awarded to petitioner. It will be seen that the Midvale Steel Co. expressed in its bid its unwillingness to agree to manufacture less than 20,000 tons of armor, and this for the reason that your petitioner could not undertake to erect a plant which would cost over \$3,000,000 unless it should procure a contract for a large amount of armor. This condition attached to the Midvale Co.'s bid is totally unlike the conditions attached to the bids of the Carnegie and Bethlehem companies in this, that those companies already have their plants erected and ready for operation and they have each of them heretofore undertaken to manufacture, and have manufactured, much smaller amounts of armor than 15,000 tons.

The importance of this matter to your petitioner and to the Government was such that petitioner fully expected that before any decision should be made in the matter of said bids petitioner would have been heard, and at such hearing petitioner could have pointed out, as it has herein undertaken to indicate, the way easily open to the Government to accept petitioner's bid for 20,000 tons of class A, or for 25,000 tons, or other larger amount; but this matter was decided by the honorable Acting Secretary of the Navy on the 11th day of August, 1900, only a day after the bids were put in, without hearing at all from the petitioner and without its ever having been pointed out to the honorable Acting Secretary of the Navy, in the papers, so far as petitioner has been able to see, that this course might have been taken.

The prices named by the Carnegie and Bethlehem companies for class A armor at this bidding were about \$50 per ton less than the prices heretofore generally understood to have been named by them as bottom prices; and the prices named by petitioner for armor of this class were about \$102 per ton below such heretofore named prices of these two old companies; and petitioner insists that the prices bid by it are fair and reasonable, and much lower than such armor has ever at any time been furnished, as well as lower than the rate at which the Government could itself manufacture its armor; and that by accepting, as hereinabove indicated, the bid or bids of your petitioner, the Government will obtain a competitor in the field of armor manufacturing. All the armor heretofore used by the Government for a number of years past has been manufactured by the Carnegie and Bethlehem Steel Cos. No other companies since those two companies were in the field, say for a period of 10 years, have ever ventured to compete with them by making any bona fide bid. The Midvale Steel Co. has undertaken to compete with them, risking millions of dollars in the venture, and it respectfully submits that its bid or bids should be accepted.

Petitioner respectfully further submits that the department can not reasonably expect ever to bring into the field a new competitor in the matter of manufacturing armor if, when the new aspirant shall have put in a reasonable bid, and one much lower than the bids of the old companies, such reasonable bid shall, nevertheless, although the Government has full power to accept it, be rejected, and the old companies, already provided with plants, shall thus be given still another opportunity with all their advantages to drive the new aspirant from the field.

The honorable Acting Secretary of the Navy has decided to set aside all the bids that were submitted on the 10th day of August, 1900, and to readvertise; and from this decision the Midvale Steel Co. respectfully takes its appeal to the honorable Secretary of the Navy, or, if he should feel that he can not now revise the act of the honorable Acting Secretary, then this appeal is to the President of the United States.

THE MIDVALE STEEL COMPANY  
By HERBERT & MICOU,  
*Attorneys.*

#### APPENDIX C.

##### ARMOR BIDS OF OCTOBER, 1903.

The Midvale Steel Co. bid as follows:

- Class A. \$398 per ton net, with no royalty.
- Class B, \$393 per ton net, with no royalty.
- Class C, \$388 per ton net, with no royalty.
- Class D, \$385 per ton net, with no royalty.

Carnegie's and Bethlehem's bids were alike, at \$420, for class A, and \$400 for other classes, with royalties aggregating \$33.60 per ton for class A armor and \$11.20 for class B armor. This makes \$453.60 per ton net for class A and \$411.20 net for class B armor.

Midvale was awarded a little over one-third of the 16,000 tons (about) required. The Bethlehem and Carnegie companies were awarded their proportion of the armor at their prices, their average being (plus royalties) \$450.60, as against an average price of \$397 bid by Midvale, which asked no royalty. This armor was for the *Mississippi* and *Idaho*.

#### APPENDIX D.

In January, 1905, when bids were opened for about 8,000 tons of armor and each maker bid the same price as before (see Appendix C), the same fight was made against Midvale getting any portion of the work. The department thereupon ordered a board to investigate the probabilities of our being able to keep our obligations under the existing contract and any new contracts that might be awarded. Although given every assurance as to the company's ability, the board reported adversely, erroneously so, as subsequent event showed. The Secretary of the Navy, Hon. Paul Morton, finally decided to give Midvale an order for 1,000 tons of the armor last needed, comprising superstructure work and turrets for the *New Hampshire*, *North Carolina*, and *Montana*, at the figures bid by it. Of course, an utterly unprofitable order. The contract was conditioned upon Midvale having fulfilled on March 1, 1906 (11 months later), all the requirements of the first contract. The balance of the armor needed was placed with the Bethlehem and Carnegie at their own figures and with the royalties added.

Midvale "made good" and was awarded the 1,000 tons referred to above.

#### APPENDIX E.

In July, 1906, bids were again opened for armor.

The Bethlehem and Carnegie Cos. bid \$381 for classes A, B, and C armor and \$350 for class D armor; Midvale's bid was \$346 for class A, \$345 for class B, \$344 for class C, and \$343 for class D armor. On this occasion no royalties were specified by the Bethlehem and Carnegie Cos., so that the apparent difference between the bids were the real differences, and the question of royalties has never again appeared in the bidding.

Falling back on the clause in the appropriation act, "having in view the best results and the most expeditious delivery," the Secretary of the Navy decided to give Midvale only one half of the order and divided the other half between Carnegie and Bethlehem, stipulating for the first time that the higher bidders must accept their share of the work at the prices of the lowest bidder. Of the 7,319 tons called for at this time for the *Michigan* and *South Carolina*, Midvale received 3,660 tons.

#### APPENDIX F.

In the summer of 1907 bids were opened for the armor required for the *Delaware* and *North Dakota*.

Midvale bid \$410 per ton, if awarded 3,028 tons; \$428 per ton if awarded 5,540 tons; and 396 tons class C at \$410 per ton, and 76 tons of class D at \$410 per ton.

Bethlehem and Carnegie bid \$420 for class A armor and \$400 for each of the other classes. Under date of June 29, 1907, the Bureau of Ordnance wrote us as follows:

DEPARTMENT OF THE NAVY,  
BUREAU OF ORDNANCE,  
Washington, D. C., June 29, 1907.

SIRS: Referring to the bids opened on the 20th instant for armor required for battleships Nos. 28 and 29:

1. After an analysis of the bids, the department considers that the price per ton offered by the Bethlehem and Carnegie Steel Cos. for classes A, B, C, and D armor, as described in the specifications, viz, \$420, \$400, \$400, and \$400, respectively, and which do not limit the locations to be assigned any portion of the armor, are the lowest prices bid.

2. In consideration, however, of the closeness of the bids, and with a view to encouraging the upkeep of your plant, the department proposes to assign you approximately 2,230 tons of the armor bid upon, provided you agree to accept it at the prices per ton of the lowest bidders, viz, class A, \$420; class B, \$400; class C, \$400; and



class D, \$400; such total, 2,230 tons (approximately) to be assigned in such proportionate amounts as to difficulties and costs of manufacture as seem fair and equitable.

3. It is thought that in the event of such possible distribution, the assignment of the 2,230 tons (approximately) to you would be about as follows:

## CLASS A.

Main belt, one side one ship.....	565.7	
Lower casemate athwartship, one side one ship.....	40.6	
Two barbettes.....	547.1	
Lower casemate, one side one ship.....	430.7	
Sides and backs, three turrets.....	192.1	
Port plates for three turrets.....	75.8	
	<hr/>	1,852.0

## CLASS B.

Around gun positions, one side one ship.....	83.4	
Upper casemate diagonal, one side one ship.....	39.8	
Two barbettes.....	89.1	
Torpedo direction station, one ship.....	5.3	
	<hr/>	217.6

## CLASS C.

Tops for three turrets (approximately).....	79.5	
Conning tower tube, one ship (approximately).....	63.0	
	<hr/>	142.5

## CLASS D.

Bolts and nuts required for the above-mentioned armor (say approximately).....	18.0	18.0
	<hr/>	2,230.1

4. Of the above-mentioned armor, that required for the torpedo directing station and conning tower tube may not be assigned under existing specifications, but may be readvertised for; in such an event, the approximate amount of armor to be allotted you under the proposed assignment would become approximately 2,162 tons.

5. Referring to the personal interview on this subject yesterday morning of representatives of your company with the chief of Bureau of Ordnance, and to their assent to the above proposition, this letter is forwarded, as agreed upon, requesting confirmation at your earliest convenience.

Respectfully,

N. E. MASON,  
*Chief of Bureau of Ordnance.*

MIDVALE STEEL Co.,  
*Philadelphia, Pa.*

(Through Inspector of Ordnance, U. S. N.)

As the department's conditions were accepted by Midvale, a contract for 2,259 tons was placed with us at an average price of about \$416.50 per ton, whereas the company had offered to deliver over 3,000 tons at \$410 per ton. Had the Navy Department chosen to award to Midvale this armor at its low figure and the remainder to its competitors at their price, the saving to the Government would have been large.

## APPENDIX G.

Consists of: United States Circuit Court of Appeals for the third circuit. Nos. 40, 41, 42, and 43, March term, 1911.

Appeal from the Circuit Court of the United States for the Eastern District of Pennsylvania. No. 1478. March term, 1911.

In the United States Court of Appeals for the third circuit.

Appeals from the Circuit Court of the United States for the Eastern District of Pennsylvania.

Brief of appellee on the expiration of patents during pendency of suits.

"Opinion fills a small book. Decision is: 'The decree of the court below will therefore be affirmed with costs, but our affirmance of such decree is based on our conclusion that claim five of Patent No. 534178, granted to Albert Schmitz and Emil Ehrensberger, is invalid; that claim one of the Patent No. 642926, granted to Albert Schmitz, is invalid; that claims one and three of Patent No. 651965 and claims one and three of Patent No. 653413, both granted to Ehrensberger, are not infringed.'"

## APPENDIX H.

On November 9, 1908, the armor required for the *Utah* and *Florida* was bid upon. The bids were as follows:

	Class A.	Class B.	Class C.	Class D.	Total.
	<i>Per ton.</i>	<i>Per ton.</i>	<i>Per ton.</i>	<i>Per ton.</i>	<i>Per ton.</i>
Bethlehem.....	\$420	\$406	\$470	\$503	\$1,804
Carnegie.....	420	415	455	600	1,890
Midvale.....	420	405	462	512	1,799

Here again Midvale's bid was the lowest received, but the decision of the Navy Department was to award each bidder one-third of the work, Midvale's portion being given to it at the figures it bid.

## APPENDIX I.

Bids for the armor required for the *Arkansas* and *Wyoming* were opened August 18, 1909. The bids were of the same general character as before, with the figure of \$420 remaining unchanged for the Class A armor, but the other classes varying. Midvale was again slightly the lowest bidder, yet it received about 800 tons less than either of its competitors, for that amount was awarded each of them before the balance was divided into thirds. All contracts were made conditional upon agreement by the contractors to furnish armor at the lowest price bid for each class by any bidder.

The bids were as follows:

	Class A.	Class B.	Class C.	Class D.	Class E.	Total.
	<i>Per ton.</i>	<i>Per ton.</i>	<i>Per ton.</i>	<i>Per ton.</i>	<i>Per ton.</i>	<i>Per ton.</i>
Bethlehem.....	\$420	\$418	\$470	\$587	\$503	\$2,403
Carnegie.....	420	420	400	600	600	2,500
Midvale.....	420	415	470	590	512	2,407

## APPENDIX J.

To consider the proposed designs for the *Texas* and *New York* armor, representatives of the armor makers were invited to meet the bureau in a conference on October 7, 1910. At this conference a full and free discussion was held as to the character of the proposed changes and the increased cost that their adoption would involve. (See Appendix K).

## APPENDIX K.

On December 1, 1910, bids on the armor required for the *Texas* and *New York* were opened. Novel designs had been prepared for the turrets of these two ships, involving the manufacture of a number of very difficult and expensive plates, and the revolving rings of the fire-control towers, forgings of great size, requiring an immense amount of machine work, were to be included in the class D hollow armor forgings.

In their proposals all the armor makers bid as they had done before on the class A armor and made a subdivision of the class A armor for the turrets, for which \$60 per ton more was asked and they increased the price of the class D armor to cover the fire-control rings.

The armor for the *Texas* was divided by the department practically into thirds, each bidder being obliged to take his quota at the lowest price bid by any of the three bidders.

Owing to the large amount by which the cost of the *Florida* had exceeded the estimates, the Navy Department was obliged to call for more money, and in making the appropriations Congress attached certain new conditions (see naval act Mar. 4, 1911). Probably on account of these the Navy Department in awarding the armor for the *New York*, which was done at a subsequent date, for the first time in its history awarded all the armor in each class to the lowest bidder in that class—dividing the



armor as nearly equally as practicable between the bidders where the figures were the same (see Appendix J). The bids were as follows:

	A.	A (turret).	C.	D.	E.
Carnegie.....	\$420	\$480	\$460	-----	\$518
Bethlehem.....	420	480	470	\$655	508
Midvale.....	420	480	470	655	512

APPENDIX L.

On January 4, 1912, bids for the armor required for the *Oklahoma* and *Nevada* were opened. The bids varied very slightly from those for the *New York* and *Texas*, the armor was divided very nearly into thirds, and in each class the price of the lowest bidder was that at which the contracts were placed.

The bids were as follows:

	A.	A (turret).	B.	C.
Carnegie.....	\$420	\$480	\$460	\$508
Bethlehem.....	420	480	470	508
Midvale.....	420	480	470	508

APPENDIX M.

Bids for the armor required for the *Pennsylvania* were opened February 18, 1913. Midvale underbid its competitors on every item, class A, class A for turrets, B, C, C bronze, and D; yet the department divided the contracts into practically equal parts, obliging its competitors to accept their share of the work at Midvale's prices, no advantage whatever accruing to Midvale from being the lowest bidder.

The prices at which this contract was placed were as follows:

- Class A, \$454.
- Class A turret, \$518.
- Class B, \$496.
- Class C, \$548.
- Class C bronze, \$1,875.
- Class D, \$708.

It will be noted that there was an increase in these figures over those previously bid, due to the adoption by Congress of the eight-hour law, which considerably increased the cost of manufacture.

The bids submitted were as follows:

	A.	A, turret.	B.	C.	D.	Bronze.
Carnegie.....	\$455.00	\$520.00	\$498.00	\$553.00	-----	\$1,900.00
Bethlehem.....	454.65	519.60	497.95	549.91	\$709.04	1,884.63
Midvale.....	454.00	518.00	496.00	548.00	708.00	1,875.00

APPENDIX N.

On August 27, 1913, bids were opened for the armor required for battleship *No. 39*. As the armor, except for new specifications, was similar to that for the *Pennsylvania*, "Midvale" bid exactly the same price that had taken that order. (See Appendix M.)

The Secretary of the Navy objected to the fact that the Carnegie and Bethlehem bids also conformed to prices that had taken the previous contract and were therefore uniform with that bid by Midvale. He announced that he would receive new bids on October 14, 1913, and would award the whole of the contract to the lowest bidder. Midvale on that date made the lowest bid and received the entire order.

The increased resisting power required of the armor for this ship, as well as the increased power to penetrate possessed by the newest type projectiles, which will be used to test it, makes us fearful lest the demands of the Navy Department have passed

the limits possible in manufacture. The failure of a few plates to pass this ballistic or firing test would entail a very great money loss to the company.

These tests are made by the Navy Department at the Indian Head Proving Grounds, and if the enormous mass of steel has not taken an absolutely perfect temper (some of these plates weigh as much as 132,500 pounds finished and 186,500 pounds in the rough, and finish 10 feet 10 inches high, 23 feet long, and 13 inches thick, while others have a thickness of 18 inches) a failure, and consequent rejection, is certain.

In these enormous plates not only a triple condition of temper is required, more intricate and difficult than good razors or springs receive, but every stage in the long and complicated method of manufacture must have reached theoretical perfection in order to pass the tests noted above. The successful production of modern armor is conceded by all competent persons to be the most difficult problem, entailing the greatest risks, that the metallurgist is called upon to meet.

Midvale's bid on October 14, 1913, was as follows:

Class A1, \$440; class A2, \$504; class B, \$482; class C (steel), \$534; class C (bronze), \$1,861; hollow forgings, \$694.

The Carnegie Steel Co. bid:

Class A1, \$447; class A2, \$511; class B, \$489.

The Bethlehem Steel Co. bid:

Class A1, \$444; class A2, \$508; class B, \$486.

#### APPENDIX O.

The Midvale Steel Co. received an additional payment of \$14,732.24 made under the following clause in the Italian contract, which payments are not made under any of the American contracts.

The following is a translation of that part of the Italian armor contract referred to above:

##### "ART. 12.—METAL CUT OFF COLD.

"When, for the presence of doors, etc., within the perimeter of the plate there is required the removal of metal from the plate cut to measure, the weight of the metal so removed shall be paid to the company assuming for a unit price that corresponding to the plate finished diminished by one-fourth, provided always that the metal be removed after the operation of final tempering.

"If, instead, the metal is removed after cementation, but before the final tempering, the deduction to be made to the unit contract price shall be made one-half.

"The same compensation is given when the perimeter of the plate has such a shape that the proportion between its superficies and that of the minimum circumscribed rectangle is less than 0.9. The weight of the metal that is missing to the completion of the aforesaid rectangle will be paid for on the basis of the preceding tariff.

"The metal taken away from the contour of the plates for the presence of cuts intended for the application of hinges shall equally be paid to the company in compensation for the work necessary to the mating of the cuts.

"The preceding rules are not applicable in connection with the drilling for bolts. Nor will there be given compensation for the parts which are removed from the finished plates to give to the edges the required inclinations, even if they be discontinued, excepting in case of mortises."

#### APPENDIX P.

For some years past there has been a steady increase in the cost of armor manufacture. Beginning with the *Utah* and *Florida* key-ways had to be cut in the abutting edges of all plates; on the *Texas* and *New York* (bids of December, 1910) the plates were made larger and thicker, requiring much new equipment for their production and the design of the turrets was radically changed with greatly increased cost of manufacture and much necessary outlay for new machinery; beginning with the *Oklahoma* and *Nevada* new and improved types of armor-piercing projectiles were specified for use in testing these plates, requiring a marked increase in their ballistic efficiency and a very heavy outlay for the experimental work involved in this improvement; with the *Pennsylvania* the 8-hour law went into operation under which, as most of the processes in armor manufacture are continuous, the maker is compelled to pay out 50 per cent more in wages with no increase in production.

The contract for the armor for the *Mississippi* was dated December, 1903. The average weight of the plates was 15 tons; the maximum weight of one plate was 29½ tons.

The contract for the armor for the *Oklahoma* was dated January, 1912. The average weight of the plates is 33½ tons; the maximum weight of one plate is 50 tons.



The contract for the armor for the *Pennsylvania* is dated March, 1913. The average weight of the plates is  $35\frac{1}{4}$  tons; the maximum weight of one plate is 60 tons.

These three contracts, covering a period of 10 years, shows the rapid increase in the size and weight of all armor. In addition to this, the difficulties and cost of machining have been increased by the cutting of vertical keyways and the fitting of plates. In the design of turrets, conning towers, uptakes, etc., the number of plates used has been reduced and instead of having plain rectangular plates intricate shapes have been substituted, which has also increased the cost of machining and assembling.

#### FIRST CONTRACT FOR ARMOR PLATE "MISSISSIPPI" AND "IDAHO," No. 10 BELT PLATE.

Maximum weight and sizes of largest plate,  $111'' \times 9'' \times 192\frac{1}{4}'' = 54,400$  lbs. finished weight;  $118'' \times 9\frac{3}{4}'' \times 228'' = 74,400$  lbs. rough weight.

Ingot for above  $= 96'' \times 22\frac{1}{2}'' \times 138'' = 123,600$  lbs.

Port plate for turrets—light in weight on account of large openings,  $94\frac{3}{16}'' \times 12'' \times 228\frac{5}{16}'' = 42,000$  lbs. finished weight;  $101'' \times 12\frac{3}{4}'' \times 252'' = 92,100$  lbs. rough weight.

Ingot for above  $= 126'' \times 26\frac{1}{8}'' = 160,000$  lbs.

Discard demanded by specifications  $= 25\%$  from top.

#### LATEST CONTRACT FOR ARMOR FOR "PENNSYLVANIA"—III BARBETTE PLATE.

Maximum weight and sizes of largest plate,  $130\frac{1}{4}'' \times 13'' \times 277'' = 132,500$  lbs. finished weight;  $142'' \times 17'' \times 272'' = 186,500$  lbs. rough weight.

Ingot for above  $= 61'' \times 110'' = 281,600$  lbs.

Port plate for turrets—light in weight on account of large port openings,  $145'' \times 18'' \times 232'' = 106,000$  lbs. finished weight;  $154'' \times 22\frac{1}{2}'' \times 235'' = 231,000$  lbs. rough weight.

Ingot for above  $= 61'' \times 110'' = 343,500$  lbs.

Discard demanded by specifications  $= 25\%$  from top.

Waste during manufacture based on difference in weight of ingot and finished plate  $= 72\frac{1}{2}\%$  for port plates, and  $53\%$  for belt plates.

(See Appendix N.)

### STATEMENT OF MR. GUILLIAEM AERTSEN.

Mr. G. Aertsen, being duly sworn, testified as follows:

1. The CHAIRMAN. What is your name?

A. Guilliaem Aertsen.

2. The CHAIRMAN. What is your official connection with the Midvale Steel Co.?

A. Auditor.

3. Q. How much does it cost your company f. o. b. to produce a ton of K. C. armor, class A-1; that is, material, labor, and shop overhead charges?—A. As a confidential employee of the Midvale Steel Co., I am not at liberty to disclose such information pertaining to its business as is held to be secret and known only to its higher officers. I must therefore respectfully decline to answer this question.

4. Q. How much do you add to this cost for deterioration of plant and administration expenses?—A. See answer to question 3.

5. Q. Has this cost been reached by taking the annual output of a single year or of a term of years and making allowance for rejections and ballistic failures?—A. See answer to question 3.

6. Q. What are the various components of this cost per ton?—A. See answer to question 3.

7. Q. What is the cost per ton of the armor ingot at the forge, including all rejections?—A. See answer to question 3.

8. Q. Give the components, with their unit prices, that enter into a furnace charge for an armor heat?—A. Pig iron, steel scrap, metallic nickel, ferromanganese, ferrosilicon, ferrochrome (and other alloys

which may be deemed beneficial), limestone, burnt lime, fluorspar, iron ore. The costs, or market values, of these components vary so constantly as to make it impossible to give their "unit prices."

9. Q. How much repair and preparation cost for the open-hearth furnace is made for each heat?—A. Ordinarily, during the interval between tapping one heat and charging raw materials for the next, the furnace is prepared for the next heat at an average cost for labor, fuel, and material, amounting to about \$25 to \$50. This does not include the expense for maintenance and general repairs of the furnace and other apparatus in the open-hearth plant, which are made periodically or from time to time.

10. Q. How much does this amount to per ton of armor ingot produced?—A. This item would amount to 50 cents or \$1 per ton on an average.

11. Q. How much does the repair and preparation cost of the ladles amount to for each ton of ingot?—A. See answer to question 9. The cost of preparation of ladles is included in the cost of preparation of furnace.

12. Q. What is the fuel charge for each ton of ingot?—A. See answer to question 3.

13. Q. What is the proportional laboratory superintendence charge for each ton of ingot?—A. See answer to question 3.

14. Q. What is the lifting, stripping, and chipping charge per ton of ingot?—A. See answer to question 3.

15. Q. What is the power charge, including steam, electric, and water, for each ton of ingot?—A. See answer to question 3.

16. Q. What is the cost for forging?—A. See answer to question 3.

17. Q. What scrap allowance is made for condemned ingots?—A. See answer to question 3.

18. Q. How many tons of armor ingots did your company manufacture last year?—A. From August 1, 1913, to August 1, 1914, approximately 12,600 tons.

19. Q. What was the total number of these ingots in tonnage which were rejected before reaching forge?—A. About 75 tons.

20. Q. How many tons of ingots were forged during the past year?—A. From August 1, 1913, to August 1, 1914, approximately 12,525 tons.

21. Q. How many tons were rejected during the forging?—A. From August 1, 1913, to August 1, 1914, approximately 152 tons.

22. Q. What scrap allowance was made for these rejected during forging?—A. Understanding this question to ask what scrap allowance in value was made, I must refer to my answer to question 3.

23. Q. What was the oxidation and scale loss at the forge?—A. The percentage of loss from oxidation and scale does not appear in our cost records.

24. Q. What did the labor for forging each ton of ingot amount to?—A. See answer to question 3.

25. Q. What did the fuel for each ton of ingot forged amount to?—A. See answer to question 3.

26. Q. What did the repairs to heating furnaces amount to for each ton of armor?—A. See answer to question 3.

27. Q. What did the electric power, light, steam, water, drafting, transportation, and inspection per ton of plate amount to during the forging?—A. See answer to question 3.



28. Of all the ingots forged and not rejected, what percentage was discarded? How many tons?—A. Our cost records do not give these figures. I beg to refer you to Mr. Francis Bradley's answer to this question.

29. Q. What allowance was made for the metal thus discarded?—A. See answer to question 3.

30. Q. What is the unit price per ton of plate when ready for carbonizing?—A. See answer to question 3.

31. Q. How many tons of armor plate were carbonized at the works of your company last year?—A. From August 1, 1913, to August 1, 1914, approximately 9,640 tons.

32. Q. What was the oxidization and scale in this treatment in tons?—A. The percentage of loss from oxidation and scale does not appear in our cost records.

33. Q. What were the total number of plates rejected during carbonization?—A. Our cost records indicate that rejections on this account have been practically nothing.

34. Q. What does the labor per ton of carbonized plate amount to?—A. See answer to question 3.

35. Q. What does the material per ton of carbonized plate amount to?—A. See answer to question 3.

36. Q. How much fuel per ton of plate is used in carbonizing?—A. See answer to question 3.

37. Q. How much did the furnace repairs per ton of carbonized plate amount to?—A. See answer to question 3.

38. Q. What does the proportional amount of steam, electric power, lighting, drafting, inspection laboratory, transportation, amount to per ton of carbonized plate?—A. See answer to question 3.

39. Q. How much is the carbonized plate worth per ton? No machining.—A. See answer to question 3.

40. Q. How many tons of armor plate were reformed by your company during the past year?—A. From August 1, 1913, to August 1, 1914, approximately, 9,105 tons.

41. Q. How many tons of plate were rejected during the reforming process, and was any allowance for the recovered material made in working the cost of armor?—A. From August 1, 1913, to August 1, 1914, approximately 210 tons. See answer to question 22.

42. Q. What does the labor per ton for reforming amount to?—A. See answer to question 3.

43. Q. What does the repairs per ton for reforming amount to?—A. See answer to question 3.

44. Q. What does the fuel per ton for reforming amount to?—A. See answer to question 3.

45. Q. What is the proportional amount of power—electric, steam, water—for reforming?—A. See answer to question 3.

46. Q. What does the proportional drafting, inspection, transportation, and laboratory for reforming amount to?—A. See answer to question 3.

47. Q. How much discard is made after reforming?—A. From August 1, 1913, to August 1, 1914, approximately 6,320 tons of forged plates were machined and approximately 3,750 tons of machined plates were shipped; the difference, 2,570 tons, was approximately the discard.

48. Q. What allowance is made for this discard in reckoning the cost?—A. See answer to question 3.

49. Q. What is the cost of armor per ton after reforging?—A. See answer to question 3.

50. Q. How many tons of armor plate were sent to treatment by your company during the past year?—A. From August 1, 1913, to August 1, 1914, approximately 8,520 tons.

51. Q. How many tons were lost during treatment by rejection?—A. From August 1, 1913, to August 1, 1914, approximately 250 tons.

52. Q. What does the labor per ton of treated plate amount to?—A. See answer to question 3.

53. Q. What does the material per ton of treated plate amount to?—A. See answer to question 3.

54. Q. What do the repairs per ton of treated plate amount to?—A. See answer to question 3.

55. Q. What does the fuel per ton of treated plate amount to?—A. See answer to question 3.

56. Q. What do the proportional charges per ton of treated plate amount to?—A. See answer to question 3.

57. Q. What is the total cost per ton of treated and rectified plate?—A. See answer to question 3.

58. Q. How many tons of armor plate were sent to machining by your company last year?—A. From August 1, 1913, to August 1, 1914, approximately 6,320 tons.

59. Q. How many tons of machined plate were produced last year?—A. From August 1, 1913, to August 1, 1914, approximately 3,750 tons.

60. Q. Were there any rejections during the process of machining; if so, how many tons, and what allowance was made for the rejected material in reckoning the final cost?—A. From August 1, 1913, to August 1, 1914, our cost records show no losses due to machining operations. Approximately 423 tons were rejected on account of failure in ballistic tests. In regard to allowance for this rejected material I must refer you to my answer to question 3.

61. Q. How much per ton does the labor of machining amount to?—A. See answer to question 3.

62. Q. How much does the machined scrap amount to?—A. See answer to question 3.

63. Q. How much does the material for machining amount to, including oil, waste, repairing of tools, supply of tools?—A. See answer to question 3.

64. Q. How much do the repairs per ton of machined plate amount to during the machining operation?—A. See answer to question 3.

65. Q. What do the proportional charges per ton of machined plate amount to?—A. See answer to question 3.

66. Q. What is the cost per ton of machined plate produced?—A. See answer to question 3.

67. Q. How many tons of machined plate were presented by your company for shipment last year?—A. See answer to question 59. From August 1, 1913, to August 1, 1914, approximately 3,750 tons.

68. Q. What does the labor and material for preparation for shipment amount to per ton of finished plate?—A. See answer to question 3.

69. Q. How are the total water, steam power, transportation, inspection, drafting, and laboratory charges reckoned?—A. See answer to question 3.



70. Q. What were the total power charges for your plant last year—by power charges is meant electric power, steam power, water power, or producer gas for running engines, as the case may be—and how did you arrive at the method of assigning the various proportions to the various operations?—A. See answer to question 3.

71. Q. The same information is desired for the laboratory, drafting, inspection, and transportation charges.—A. See answer to question 3.

72. Q. What is the cost per ton of shipped plate, class A-2?—A. See answer to question 3.

73. Q. What is the cost per ton of shipped plate, class B?—A. See answer to question 3.

74. Q. What was the average cost per ton of class C steel armor?—A. See answer to question 3.

75. Q. What do you reckon your working capital to be?—A. Understanding this question to apply only to that part of the company's working capital which is devoted to armor plate, I would reply that the figure will depend upon the size in tonnage and value of the armor-plate contract in process at any given time and its proportion to other work in process during the same period in other parts of our plant. Under ordinary conditions \$750,000 to \$1,000,000 would be a conservative low estimate for working capital.

76. Q. What does the maintenance of your plant amount to per annum?—A. See answer to question 3.

77. Q. Is this amount over and above the repairs which have been charged to the various operations comprising the total manufacture and separate from depreciation?—A. See answer to question 3.

78. Q. What does this maintenance mean; to what is it applied?—A. See answer to question 3.

79. Q. What is the total of proportional administration charges made to armor; how has this been arrived at?—A. See answer to question 3.

80. Q. Give a tabulated list showing the various salaries paid, and how proportionally divided, so as to include the armor plant?—A. See answer to question 3.

81. Q. How much did the insurance charges on the armor plant amount to?—A. See answer to question 3.

82. Q. How much taxes are chargeable to the armor plant?—A. See answer to question 3.

83. Q. How much do you charge to armor in behalf of the pension fund and liability fund?—A. See answer to question 3.

84. Q. How much depreciation is charged against the armor plant; what is this depreciation; how has it been arrived at?—A. See answer to question 3.

85. Q. After a year's operations within which a certain sum of money has been set aside from the proceeds of the manufacture of armor for depreciation charge, what is done with this money?—A. See answer to question 3.

86. Q. After depreciation charge has been made to a year's operation, and there have been no replacements of tools, is this amount used to amortize the original investment?—A. See answer to question 3.

87. Q. Since the erection of your armor plant what has been the total amount of depreciation which has been charged into the cost of armor?—A. See answer to question 3.

88. Q. How much, if any, of this sum of money has been actually used for the installation of new machinery in place of old, for building new buildings, furnaces, etc., in place of old, and has this expenditure been added to the capital account?—A. See answer to question 3.

89. Q. The remainder of this sum which has not been expended, has it been used for amortizing any of the original investment?—A. See answer to question 3.

90. Q. How much money is invested in your armor plant?—A. See answer to question 3.

91. Q. Does this represent the total amount which has been expended for this plant, inclusive of all depreciation replacements?—A. See answer to question 3.

92. Q. In reckoning your profit, is it reckoned as a profit on the total amount of money which has been put into the armor plant, or on the amount which has been put into the armor plant less all depreciation which has not been used for the purpose of replacement?—A. See answer to question 3.

#### STATEMENT OF MR. FRANCIS BRADLEY.

Mr. Francis Bradley, being duly sworn, testified as follows:

1. The CHAIRMAN. What is your name?

Answer. Francis Bradley.

2. The CHAIRMAN. What is your official connection with the Midvale Steel Co.?

. Answer. Superintendent of armor-plate department.

3. Q. How much does it cost your company f. o. b. to produce a ton of K. C. armor, class A-1; that is, material, labor, and shop overhead charges?—A. My duties are the production of armor and the cost is outside my sphere.

4. Q. How much do you add to this cost for deterioration of plant and administration expenses?—A. Refer to my answer to question 3.

5. Q. Has this cost been reached by taking the annual output of a single year, or of a term of years, and making allowance for rejections and ballistic failures?—A. Refer to my answer to question 3.

6. Q. What are the various components of this cost per ton?—A. Refer to my answer to question 3.

7. Q. What is the cost per ton of the armor ingot at the forge, including all rejections?—A. Refer to my answer to question 3.

8. Q. Give the components, with their unit prices, that enter into a furnace charge for an armor heat?—A. The components of an armor ingot heat are pig iron, scrap, metallic nickel, limestone, burnt lime, iron ore, fluorspar, ferromanganese, ferrosilicon, and ferrochrome. In order to make up for the loss in melting, 15 per cent greater weight of ingredients are charged into the furnace than are produced in the ingot. The unit price varies so greatly from day to day that it would be impossible to give this information.

9. Q. How much repair and preparation cost for the open-hearth furnace is made for each heat?—A. Refer to my answer to question 3.

10. Q. How much does this amount to per ton of armor ingot produced?—A. Refer to my answer to question 3.



11. Q. How much does the repair and preparation cost of the ladles amount to for each ton of ingot?—A. Refer to my answer to question 3.

12. Q. What is the fuel charge for each ton of ingot?—A. Refer to my answer to question 3.

13. Q. What is the proportional laboratory superintendence charge for each ton of ingot?—A. Refer to my answer to question 3.

14. Q. What is the lifting, stripping, and chipping charge per ton of ingot?—A. Refer to my answer to question 3.

15. Q. What is the power charge, including steam, electric and water, for each ton of ingot?—A. Refer to my answer to question 3.

16. Q. What is the cost for forging?—A. Refer to my answer to question 3.

17. Q. What scrap allowance is made for condemned ingots?—A. Refer to my answer to question 3.

18. Q. How many tons of armor ingots did your company manufacture last year?—A. From August 1, 1913, to August 1, 1914, about 12,600 tons.

19. Q. What was the total number of these ingots in tonnage which were rejected before reaching forge?—A. About 75 tons rejected.

20. Q. How many tons of ingots were forged during the past year?—A. About 12,525 tons from August 1, 1913, to August 1, 1914.

21. Q. How many tons were rejected during the forging?—A. From August 1, 1913, to August 1, 1914, about 152.

22. Q. What scrap allowance was made for these rejected during forging?—A. Refer to my answer to question 3.

23. Q. What was the oxidization and scale loss at the forge?—A. This is not accurately known but is estimated at 3 per cent for each heating.

24. Q. What did the labor for forging each tone of ingot amount to?—A. Refer to my answer to question 3.

25. Q. What did the fuel for each ton of ingot forged amount to?—A. Refer to my answer to question 3.

26. Q. What did the repairs to heating furnaces amount to for each ton of armor?—A. Refer to my answer to question 3.

27. Q. What did the electric power, light, steam, water, drafting, transportation, and inspection per ton of plate amount to during the forging?—A. Refer to my answer to question 3.

28. Q. Of all the ingots forged and not rejected, what percentage was discarded? How many tons?—A. Seven and one-fourth per cent for cracks and tears. This amounted to 910 tons.

29. Q. What allowance was made for the metal thus discarded?—A. Refer to my answer to question 3.

30. Q. What is the unit price per ton of plate when ready for carbonizing?—A. Refer to my answer to question 3.

31. Q. How many tons of armor plate were carbonized at the works of your company last year?—A. From August 1, 1913, to August 1, 1914, about 9,640 tons.

32. Q. What was the oxidization and scale in this treatment in tons?—A. Approximately 6 per cent.

33. Q. What were the total number of plates rejected during carbonization?—A. About 125 tons.

34. Q. What does the labor per ton of carbonized plate amount to?—A. Refer to my answer to question 3.

35. Q. What does the material per ton of carbonized plate amount to?—A. Refer to my answer to question 3.

36. Q. How much fuel per ton of plate is used in carbonizing?—A. Refer to my answer to question 3.

37. Q. How much did the furnace repairs per ton of carbonized plate amount to?—A. Refer to my answer to question 3.

38. Q. What does the proportional amount of steam, electric power, lighting, drafting, inspection, laboratory, transportation, amount to per ton of carbonized plate?—A. Refer to my answer to question 3.

39. Q. How much is the carbonized plate worth per ton? No machining.—A. Refer to my answer to question 3.

40. Q. How many tons of armor plate were reformed by your company during the past year?—A. From August 1, 1913, to August 1, 1914, about 9,105 tons.

41. Q. How many tons of plate were rejected during the reforming process, and was any allowance for the recovered material made in working the cost of armor?—A. From August 1, 1913, to August 1, 1914, 210 tons. I do not know the rate for the allowance made.

42. Q. What does the labor per ton for reforming amount to?—A. Refer to my answer to question 3.

43. Q. What does the repairs per ton for reforming amount to?—A. Refer to my answer to question 3.

44. Q. What does the fuel per ton for reforming amount to?—A. Refer to my answer to question 3.

45. Q. What is the proportional amount of power—electric, steam, water—for reforming?—A. Refer to my answer to question 3.

46. Q. What does the proportional drafting, inspection, transportation, and laboratory for reforming amount to?—A. Refer to my answer to question 3.

47. Q. How much discard is made after reforming?—A. This question is very blind, but as amplified by Admiral Strauss, can best be answered by the fact that from August 1, 1913, to August 1, 1914, we sent into the machine shop 6,320 tons and shipped 3,750 tons, making the amount discarded during this period about 2,570 tons.

48. Q. What allowance is made for this discard in reckoning the cost?—A. Refer to my answer to question 3.

49. Q. What is the cost of armor per ton after reforming?—A. Refer to my answer to question 3.

50. Q. How many tons of armor plate were sent to treatment by your company during the past year?—A. From August 1, 1913, to August 1, 1914, about 8,520 tons.

51. Q. How many tons were lost during treatment by rejection?—A. From August 1, 1913, to August 1, 1914, about 250 tons.

52. Q. What does the labor per ton of treated plate amount to?—A. Refer to my answer to question 3.

53. Q. What does the material per ton of treated plate amount to?—A. Refer to my answer to question 3.

54. Q. What do the repairs per ton of treated plate amount to?—A. Refer to my answer to question 3.

55. Q. What does the fuel per ton of treated plate amount to?—A. Refer to my answer to question 3.

56. Q. What do the proportional charges per ton of treated plate amount to?—A. Refer to my answer to question 3.



57. Q. What is the total cost per ton of treated and rectified plate?—A. Refer to my answer to question 3.

58. Q. How many tons of armor plate were sent to machining by your company last year?—A. From August 1, 1913, to August 1, 1914, about 6,320 tons.

59. Q. How many tons of machined plate were produced last year?—A. From August 1, 1913, to August 1, 1914, about 3,750 tons.

60. Q. Were there any rejections during the process of machining? If so, how many tons, and what allowance was made for the rejected material in reckoning the final cost?—A. From August 1, 1913, to August 1, 1914, there were no plates rejected due to machining; but this company suffered a loss of 423 tons due to failure in ballistic tests. I have no knowledge of the allowance made for this rejected material.

61. Q. How much per ton does the labor of machining amount to?—A. Refer to my answer to question 3.

62. Q. How much does the machined scrap amount to?—A. Refer to my answer to question 3.

63. Q. How much does the material for machining amount to, including oil, waste, repairing of tools, supply of tools?—A. Refer to my answer to question 3.

64. Q. How much do the repairs per ton of machined plate amount to during the machining operation?—A. Refer to my answer to question 3.

65. Q. What do the proportional charges per ton of machined plate amount to?—A. Refer to my answer to question 3.

66. Q. What is the cost per ton of machined plate produced?—A. Refer to my answer to question 3.

67. Q. How many tons of machined plate were presented by your company for shipment last year?—A. Refer to my answer to question 59.

68. Q. What does the labor and material for preparation for shipment amount to per ton of finished plate?—A. Refer to my answer to question 3.

69. Q. How are the total water, steam-power, transportation, inspection, drafting, and laboratory charges reckoned?—A. Refer to my answer to question 3.

70. Q. What were the total power charges for your plant last year (by power charges is meant electric power, steam power, water power, or producer gas for running engines, as the case may be), and how did you arrive at the method of assigning the various proportions to the various operations?—A. Refer to my answer to question 3.

71. Q. The same information is desired for the laboratory, drafting, inspection, and transportation charges.—A. Refer to my answer to question 3.

72. Q. What is the cost per ton of shipped plate, class A-2?—A. Refer to my answer to question 3.

73. Q. What is the cost per ton of shipped plate, class B?—A. Refer to my answer to question 3.

74. Q. What was the average cost per ton of class C steel armor?—A. Refer to my answer to question 3.

75. Q. What do you reckon your working capital to be?—A. Refer to my answer to question 3.

76. Q. What does the maintenance of your plant amount to per annum?—A. Refer to my answer to question 3.

77. Q. Is this amount over and above the repairs which have been charged to the various operations comprising the total manufacture, and separate from depreciation?—A. Refer to my answer to question 3.

78. Q. What does this maintenance mean; to what is it applied?—A. Refer to my answer to question 3.

79. Q. What is the total of proportional administration charges made to armor; how has this been arrived at?—A. Refer to my answer to question 3.

80. Q. Give a tabulated list showing the various salaries paid, and how proportionately divided, so as to include the armor plant?—A. Refer to my answer to question 3.

81. Q. How much did the insurance charges on the armor plant amount to?—A. Refer to my answer to question 3.

82. Q. How much taxes are chargeable to the armor plant?—A. Refer to my answer to question 3.

83. Q. How much do you charge to armor in behalf of the pension fund and liability fund?—A. Refer to my answer to question 3.

84. How much depreciation is charged against the armor plant; what is this depreciation; how has it been arrived at?—A. Refer to my answer to question 3.

85. Q. After a year's operations within which a certain sum of money has been set aside from the proceeds of the manufacture of armor for depreciation charge, what is done with this money?—A. Refer to my answer to question 3.

86. Q. After depreciation charge has been made to a year's operation, and there have been no replacements of tools, is this amount used to amortize the original investment?—A. Refer to my answer to question 3.

87. Q. Since the erection of your armor plant what has been the total amount of depreciation which has been charged into the cost of armor?—A. Refer to my answer to question 3.

88. Q. How much, if any, of this sum of money has been actually used for the installation of new machinery in place of old, for building new buildings, furnaces, etc., in place of old, and has this expenditure been added to the capital account?—A. Refer to my answer to question 3.

89. Q. The remainder of this sum which has not been expended, has it been used for amortizing any of the original investment?—A. Refer to my answer to question 3.

90. Q. How much money is invested in your armor plant?—A. Refer to my answer to question 3.

91. Q. Does this represent the total amount which has been expended for this plant, inclusive of all depreciation replacements?—A. Refer to my answer to question 3.

92. Q. In reckoning your profit, is it reckoned as a profit on the total amount of money which has been put into the armor plant, or on the amount which has been put into the armor plant less all depreciation which has not been used for the purpose of replacement?—A. Refer to my answer to question 3.





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# APPENDIX B

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## MINUTES OF THE COMMITTEE

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## APPENDIX B.

### MINUTES OF THE COMMITTEE.

In pursuance of the act of Congress approved June 30, 1914, the committee met at 12 o'clock noon, Wednesday, November 18, 1914, in the room of the Senate Committee on Naval Affairs.

Present: Hon. B. R. Tillman, chairman of the Committee on Naval Affairs, United States Senate; Hon. L. P. Padgett, M. C., chairman of the Committee on Naval Affairs, House of Representatives; Rear Admiral Joseph Strauss, United States Navy, Chief of Bureau of Ordnance, Navy Department.

Moved and seconded that Senator B. R. Tillman be made chairman of the committee. Motion carried.

Moved and seconded that Admiral Strauss be made secretary of the committee. Motion carried.

The committee discussed informally various matters with reference to its investigation and decided to visit the armor-plate factory of the Carnegie Steel Co., Pittsburgh, Pa.; that of the Midvale Steel Co., Philadelphia, Pa.; and that of the Bethlehem Steel Co., South Bethlehem, Pa.

At 1.15 p. m. the committee adjourned to meet to-morrow, Thursday, November 19, at 10 o'clock a. m.

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WASHINGTON, D. C., *November 19, 1914.*

The committee met at 10 a. m., Thursday, November 19, 1914, in the room of the Senate Committee on Naval Affairs.

Present: Hon. B. R. Tillman, chairman; Rear Admiral J. Strauss, United States Navy, secretary.

Hon. L. P. Padgett, M. C., was absent on account of illness.

Committee adjourned at 10.05 a. m., subject to the call of the chairman.

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WASHINGTON, D. C., *November 22, 1914.*

On November 22 the committee met on call of the chairman and proceeded to Pittsburgh, Pa., arriving on the morning of the 23d.

The committee met at the Fort Pitt Hotel at 9.15 a. m.

Present: Hon. B. R. Tillman (chairman) presiding; Hon. L. P. Padgett, M. C., and Rear Admiral J. Strauss, United States Navy members of the committee. Lieut. Commander C. C. Bloch, United States Navy, Mr. J. B. Knight, and Mr. E. S. Theall, assistants to the committee.

The committee then proceeded to the office of the Carnegie Steel Co., whence they were taken to the works of the company at Homestead, Pa.



The committee inspected the open-hearth department and all of the works devoted to the manufacture of armor, accompanied by Mr. A. C. Dinkey, president of the company, Mr. R. H. Watson, assistant general superintendent, and Mr. L. R. Custer, superintendent of the armor department.

The members of the committee then inspected the plate mill and the mill for the manufacture of structural material.

The committee then proceeded to Pittsburgh and held a meeting at the Fort Pitt Hotel. Arrangements were made by which hearings were to be held at the office of the Carnegie Steel Co. beginning at 9 a. m., November 24.

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PITTSBURGH, PA., *November 24, 1914.*

The committee proceeded at 9 a. m. to the office of the Carnegie Steel Co. and held its hearings. (See Appendix A.)

The committee met at 7 p. m. at the Fort Pitt Hotel and elected Hon. L. P. Padgett, M. C., as vice chairman of the committee.

The committee left Pittsburgh on the evening of November 24, arriving in Philadelphia the morning of the following day and proceeded at once to South Bethlehem, Pa., arriving there at 10.07 a. m.

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SOUTH BETHLEHEM, PA., *November 25, 1914.*

The committee inspected the works of the Bethlehem Steel Co., accompanied by Mr. E. G. Grace, president, and other officials of the Bethlehem Steel Co., and held a hearing in the office of the company in the afternoon of that same day, November 25. (See Appendix A.)

The committee then proceeded to Philadelphia, Pa., arriving there that same evening.

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PHILADELPHIA, PA., *November 27, 1914*

The committee inspected the works of the Midvale Steel Co., accompanied by Mr. W. P. Barba, manager, and other officials of the company. They then held a hearing in the office of the company. (See Appendix A.)

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PHILADELPHIA, PA., *November 28, 1914.*

The committee met at 9.10 a. m. at the Hotel Walton.

Present: Hon. B. R. Tillman (chairman), presiding; Hon. L. P. Padgett, M. C.; and Rear Admiral Joseph Strauss, United States Navy, members of the committee. Lieut. Commander C. C. Bloch, United States Navy; Mr. J. B. Knight, and Mr. E. S. Theall, assistants to the committee.

Matters were discussed relative to the future meetings of the committee. It was determined to take a recess until Tuesday, December 8, at 2.30 p. m.

Adjourned.

WASHINGTON, D. C., *December 8, 1914.*

The committee met at 2.30 in the office of the chairman.

Present: Hon. B. R. Tillman (chairman), presiding; Rear Admiral Joseph Strauss, United States Navy.

Hon. L. P. Padgett, M. C., was unavoidably detained by a committee hearing.

The committee adjourned subject to the call of the chairman.

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PHILADELPHIA, PA., *November 28, 1914.*

The committee met at 9.10 a. m., at the Hotel Walton.

Present: Hon. B. R. Tillman (chairman) presiding; Hon. L. P. Padgett, M. C., and Rear Admiral Joseph Strauss, United States Navy, members of the committee. Lieut. Commander C. C. Bloch, United States Navy; Mr. J. B. Knight and Mr. E. S. Theall, assistants to the committee.

Matters were discussed relative to the future meetings of the committee. It was determined to take a recess until Tuesday, December 8, at 2.30 p. m.

Adjourned.

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WASHINGTON, D. C., *December 8, 1914.*

The committee met at 2.30 in the office of the chairman.

Present: Hon. B. R. Tillman (chairman) presiding; Rear Admiral Joseph Strauss, United States Navy.

Hon. L. P. Padgett, M. C., was unavoidably detained by a committee hearing.

The committee adjourned subject to the call of the chairman.

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WASHINGTON, D. C., *February 1, 1915.*

The committee met at 2 o'clock p. m. at the office of the chairman.

Present: Hon. B. R. Tillman (chairman) presiding; Hon. L. P. Padgett, M. C., and Rear Admiral Joseph Strauss, United States Navy, members of the committee.

At the request of the chairman of the committee Mr. B. J. Morrison, of Philadelphia, Pa., appeared before the committee and an informal discussion took place, whereupon Mr. Morrison stated that he would be ready to appear before the committee at a future date, prepared to give testimony under oath.

Adjourned, subject to call of the chairman.

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WASHINGTON, D. C., *February 19, 1915.*

The committee met at 2 o'clock p. m. at the office of the chairman.

Present: Hon. B. R. Tillman (chairman) presiding; Hon. L. P. Padgett, M. C., and Rear Admiral Joseph Strauss, members of the committee. Lieut. Commander C. C. Bloch, United States Navy, assistant to the committee.

The committee discussed the form of the report and adjourned at 3.45 p. m. until February 23, 1915, at 2 p. m.



WASHINGTON, D. C., *February 23, 1915.*

The committee met at 2 o'clock p. m. at the office of the chairman.

Present: Hon. B. R. Tillman (chairman) presiding; Hon. L. P. Padgett, M. C., and Rear Admiral Joseph Strauss, United States Navy, members of the committee. Lieut. Commander C. C. Bloch, United States Navy, assistant to the committee.

The committee further discussed its report and adjourned at 3.45 p. m.

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ESTIMATES  
OF  
COST OF ARMOR FACTORIES  
OF  
20,000 AND 10,000 TONS CAPACITY

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SUMMARY OF COST OF ARMOR PLANT.

	10,000-ton capacity.	20,000-ton capacity.
Site, grading and clearing, fence .....	\$28,000	\$34,000
Office.....	53,750	74,000
Physical and chemical laboratory.....	46,875	71,062
Miscellaneous shops and buildings.....	169,397	247,636
Locomotive house and rolling stock.....	124,200	169,300
Boiler plant.....	285,000	457,000
Hydraulic system.....	35,500	55,000
Electric power house and transmission lines.....	216,600	351,525
Gas producer house.....	246,650	442,250
Coal storage and crushing plant.....	34,800	47,200
Open-hearth plant.....	682,950	1,057,800
Forging and bending shop.....	1,777,800	2,728,500
Cementing and tempering shop.....	1,105,800	1,912,500
Machine shop.....	1,224,594	1,744,869
Total (exclusive of land).....	6,031,916	9,392,642
10 per cent incidentals, engineering expenses, unforeseen contingencies.....	603,191	939,264
Grand total.....	6,635,107	10,331,906



DETAILED COST OF ARMOR PLANT.

Item.	Source of estimate.	10,000-ton plant.			20,000-ton plant.			
		Dimensions or number of units.	Cost per unit.	Total.	Dimensions or number of units.	Cost per unit.	Total.	
FOR GENERAL USE.								
Site, location unknown, say.....	Information received by committee.	60 acres.....	.....	\$12,000.00	70 acres.....	\$200.00	\$14,000.00	
Grading and clearing, depends on location and natural conditions.		.....	.....	8,000.00	.....	.....	10,000.00	
Fence.....		.....	.....	8,000.00	.....	.....	10,000.00	
Total.....		.....	.....	28,000.00	.....	.....	34,000.00	
OFFICE.								
Building, 2-story brick house; offices on lower floor; tracing room, blue-print room, photographic room, and vault on second floor, including heating, lighting, and plumbing.	Bureau of Yards and Docks...	100 by 50 by 31.....	\$0.25	38,750.00	115 by 60 by 31.....	.25	54,000.00	
Equipment, unknown, say.....		.....	.....	15,000.00	.....	.....	20,000.00	
Total.....	.....	.....	.....	53,750.00	.....	.....	74,000.00	
PHYSICAL AND CHEMICAL LABORATORY.								
Building, 2-story brick; including heating, lighting, and plumbing.	Bureau of Yards and Docks...	50 by 50 by 31.....	.25	19,375.00	75 by 50 by 31.....	.25	29,062.00	
Chemical equipment.....		.....	.....	8,000.00	.....	.....	12,500.00	
Pyrometric equipment.....		do.....	.....	13,000.00	.....	.....	20,000.00	
Physical laboratory equipment.....		do.....	.....	6,500.00	.....	.....	9,500.00	
Total.....	.....	.....	.....	46,875.00	.....	.....	71,062.00	
MISCELLANEOUS SHOPS AND BUILDINGS.								
Tool house.....	Bureau of Yards and Docks...	100 by 15 by 12.....	.....	1,400.00	150 by 15 by 12.....	.....	2,000.00	
Equipment.....		.....	.....	300.00	.....	.....	500.00	
Brick shed.....		Bureau of Yards and Docks...	200 by 40 by 19.....	.03	4,560.00	300 by 40 by 19.....	.03	6,840.00
Carpenter shop, 2-story brick		do.....	60 by 50 by 39½.....	.10	11,850.00	80 by 50 by 39½.....	.10	15,800.00
Equipment.....		Washington Navy Yard.....	.....	.....	5,000.00	.....	.....	7,510.00
Blacksmith shop, 1-story brick		.....	100 by 85 by 22½.....	.07	13,387.00	100 by 85 by 22½.....	.07	13,387.00
Equipment.....	.....	.....	.....	5,000.00	.....	.....	5,000.00	

Storehouse, 2-story brick.....	Bureau of Yards and Docks.....	60 by 40 by 31.....	.15	11,160.00	80 by 40 by 31.....	.15	14,880.00
Equipment.....	Inspector of ordnance.....	.....	.....	1,500.00	.....	.....	2,000.00
Comfort stations.....	Bureau of Yards and Docks.....	2.....	5,000.00	10,000.00	4.....	5,000.00	20,000.00
Water supply, with necessary piping; and sewerage, with necessary piping (depends on location), say.....	do.....	.....	.....	57,000.00	.....	.....	85,000.00
Fire service, including pumps, shed, fire stations, hose, fire hydrants.....	Inspector of ordnance.....	.....	.....	10,000.00	.....	.....	15,000.00
Oxy-hydrogen building, with equipment.....	do.....	.....	.....	20,000.00	.....	.....	35,000.00
Roads, pavements, etc. (depends on loca- tion), say.....	.....	.....	.....	5,000.00	.....	.....	7,500.00
Telephones.....	Washington Navy Yard.....	.....	.....	2,000.00	33 phones and switch- boards.....	.....	3,600.00
Dispensary, 2-story brick.....	Bureau of Yards and Docks.....	40 by 20 by 30.....	.26	6,240.00	40 by 20 by 30.....	.26	6,240.00
Lighting.....	Washington Navy Yard.....	.....	.....	1,000.00	.....	.....	1,379.00
Fire-alarm system.....	do.....	6 stations.....	.....	4,000.00	10 stations.....	.....	6,000.00
Total.....	.....	.....	.....	169,397.00	.....	.....	247,636.00
LOCOMOTIVE HOUSE AND ROLLING STOCK.							
Building.....	Bureau of Yards and Docks.....	75 by 60 by 15.....	.10	6,750.00	100 by 60 by 15.....	.10	9,000.00
Tools.....	do.....	.....	.....	3,000.00	.....	.....	4,000.00
Locomotives.....	Manufacturer.....	2.....	7,500.00	15,000.00	3.....	7,500.00	22,500.00
Cars.....	do.....	{ 1 200-ton.....	4,000.00	4,000.00	1 200-ton.....	4,000.00	4,000.00
Electric cars.....	do.....	{ 4 50-ton.....	1,200.00	4,800.00	8 50-ton.....	1,200.00	9,600.00
Bogies.....	do.....	2 50-ton.....	5,000.00	10,000.00	3 50-ton.....	5,000.00	15,000.00
Railway track, turnouts, yards, and shops.....	do.....	15.....	310.00	4,650.00	20.....	310.00	6,200.00
Trolley track.....	Bureau of Yards and Docks.....	4 miles.....	14,000.00	56,000.00	5 miles.....	14,000.00	70,000.00
Locomotive cranes.....	do.....	2,000 feet.....	3.00	6,000.00	2,000 feet.....	3.00	6,000.00
Railway scales.....	Naval proving ground.....	1 15-ton.....	9,000.00	9,000.00	2 15-ton.....	9,000.00	18,000.00
Total.....	Bureau of Yards and Docks.....	1 150-ton.....	5,000.00	5,000.00	1 150-ton.....	5,000.00	5,000.00
.....	.....	.....	.....	124,200.00	.....	.....	169,300.00
BOILER FLANT.							
Building, including runway for crane.....	Bureau of Yards and Docks.....	150 by 100.....	1 6.00	90,000.00	230 by 100.....	1 6.00	138,000.00
Boilers, with stokers and stacks.....	do.....	12 500-horsepower each.....	.....	150,000.00	20 150-horsepower each.....	.....	247,000.00
Coal and ash handling machinery, coal bin, and underground ash tunnel.....	do.....	Overhead bunker; un- derground ash tun- nel.....	.....	30,000.00	.....	.....	50,000.00
Feed-water heaters, pumps, piping, steam lines.....	do.....	.....	.....	15,000.00	.....	.....	22,000.00
Total.....	.....	.....	.....	285,000.00	.....	.....	457,000.00

1 Per square foot.



Detailed cost of armor plant—Continued.

Item.	Source of estimate.	10,000-ton plant.			20,000-ton plant.		
		Dimensions or number of units.	Cost per unit.	Total.	Dimensions or number of units.	Cost per unit.	Total.
HYDRAULIC SYSTEM, WATER POWER FOR ALL PURPOSES EXCEPT LARGE PRESSES.							
No building; this machinery to be in press house.	Information received by committee.						
Pumps and auxiliaries, including accumulators.	do.			\$20,500.00			\$35,000.00
Valves and piping to points of consumption.	do.			15,000			20,000.00
Total.				35,500.00			55,000.00
ELECTRIC POWER HOUSE AND POWER TRANSMISSION LINES.							
Building, structural steel and brick.	Bureau of Yards and Docks.	60 by 75.	1 \$10.00	45,000.00	60 by 100.	1 \$10.00	60,000.00
Turbo generators, condensers, and piping.	Manufacturer.	One 1,500 kilowatt, two 1,000 kilowatt.		100,000.00	Two 3,000 kilowatt.		174,500.00
Traveling crane and necessary auxiliaries.				9,600.00			9,600.00
Transmission lines to points of consumption, including conduits, switchboard, and wiring in power house.	Washington Navy Yard.			20,000.00			27,425.00
5,000 cubic feet air compressors, condensers, foundations, etc.	Bureau of Yards and Docks.	1.		7,000.00			10,000.00
Total.				35,000.00	2.		70,000.00
				216,600.00			351,525.00
GAS-PRODUCER HOUSE.							
Buildings, structural steel and galvanized iron, including foundations.	Manufacturers.	19 producers.	4,000.00	76,000.00	35 producers.	4,000.00	140,000.00
Gas producers, complete:							
For open-hearth furnaces.	do.	Six 10-foot.	5,000.00	30,000.00	Ten 10-foot.	5,000.00	50,000.00
For heating furnaces for cementing, forging, and tempering.	do.	Thirteen 10-foot.	5,000.00	65,000.00	Twenty-five 10-foot.	5,000.00	125,000.00
Erection of producers.	Information received by committee.	7 per cent.	350.00	6,650.00	7 per cent.	350.00	12,250
Gas mains.	do.			50,000.00			80,000
Coal bins and ash handling.	do.		1,000.00	19,000.90		1,000.00	35,000.00
Total.				246,650.00			442,250.00

COAL STORAGE AND CRUSHING PLANT.									
Cranes, crushers, elevators, conveyors.....	Information received by committee.....								
Coal cars.....	do.....	4.	1,200.00	30,000.00			6.	1,200.00	40,000.00
Total.....				34,800.00					7,200.00
OPEN-HEARTH PLANT.									
Building, structural steel and galvanized-iron construction, including crane runways.	Bureau of Yards and Docks.....	500 by 80 by 50, 500 by 166 by 50.	.05	267,500.00			700 by 80 by 30, 700 by 166 by 50.	.05	374,000.00
Cranes, electric traveling and jib.....	Manufacturers.....	One 200-ton and 30-ton auxiliary.	50,000.00	50,000.00			One 200-ton and 30-ton auxiliary.	50,000.00	50,000.00
	do.....	One 100-ton and 25-ton auxiliary.	25,000.00	25,000.00			Two 100-ton and 25-ton auxiliary.	25,000.00	50,000.00
	do.....	Three 10-ton jib.....	4,000.00	12,000.00			Five 10-ton electric jib.	4,000.00	20,000.00
Furnaces, includes stacks, flues, and regenerative chambers.		Three 60-ton.....	60,000.00	180,000.00			Five 60-ton.....	60,000.00	300,000.00
Electric charging machines.....	Inspector of ordnance.....	1.....	15,000.00	15,000.00			2.....	15,000.00	30,000.00
Ladles.....	Information received by committee.....	Two 75-ton.....	2,000.00	4,000.00			Three 75-ton.....	2,000.00	6,000.00
	Manufacturers.....	Two 50-ton.....	1,600.00	3,200.00			Four 50-ton.....	1,600.00	6,400.00
	do.....	One 30-ton.....	950.00	950.00			Two 30-ton.....	950.00	1,900.00
Casting pit, concrete.....	Bureau of Yards and Docks.....	One 40 by 20 by 23.....	10,000.00	10,000.00			Two 40 by 20 by 23.....	10,000.00	20,000.00
Bogies, charging cars.....	Manufacturer.....	30.....	310.00	9,300.00			50.....	310.00	15,500.00
Charging boxes.....	do.....	100.....	35.00	3,500.00			200.....	35.00	7,000.00
Scales.....	Bureau of Yards and Docks.....	One 50-ton.....	2,500.00	2,500.00			Two 50-ton.....	2,500.00	5,000.00
Laboratory for carbon determination, must be in open-hearth plant.	Inspector of ordnance.....	1.....	2,000.00	2,000.00			1.....	2,000.00	2,000.00
Flasks for armor, to be made of good grade of east iron; each mold will weigh in the neighborhood of 200,000 pounds.		8.....	( <sup>2</sup> )	48,000.00			16.....	( <sup>2</sup> )	96,000.00
Stock yard.....	Bureau of Yards and Docks.....	One 10-ton crane, with runway.	12,500.00	12,500.00			Two 10-ton cranes, with 600 feet of runway.	12,500.00	25,000.00
Serap yard:	Inspector of ordnance.....	1.....	8,000.00	8,000.00			1.....	8,000.00	8,000.00
Shears.....	do.....	1.....	7,000.00	7,000.00			1.....	7,000.00	7,000.00
10-ton drop crane.....	do.....	1.....	10,000.00	10,000.00			1.....	10,000.00	10,000.00
Crane runways.....	do.....		8,000.00	8,000.00				15,000.00	15,000.00
Bins for dolomite, magnesite, nickel, etc.....									
Special rolling stock:	Manufacturer.....	5.....	500.00	2,500.00			10.....	500.00	5,000.00
Ingot transfer cars.....	Inspector of ordnance.....	1.....	2,000.00	2,000.00			2.....	2,000.00	4,000.00
Cinder cars.....									
Total.....				682,950.00					1,057,800.00

<sup>1</sup> Square foot.

<sup>2</sup> Per producer.

<sup>3</sup> \$0.03 per pound.



Detailed cost of armor plant—Continued.

Item.	Source of estimate.	10,000-ton plant.			20,000-ton plant.		
		Dimensions or number of units.	Cost per unit.	Total.	Dimensions or number of units.	Cost per unit.	Total.
FORGING AND BENDING SHOP.  Building, structural steel, with corrugated galvanized-iron sides. Furnaces: Ingot-heating. Regenerative, car-bottom, plate-heating. Presses: Forging presses, with intensifiers and pumps, piping, cranes, completely installed. Cranes.  Tanks for water and oil, with pumps. Dies and tools. Scaling machines. Pipes for steam, air, and water in the building and to the boiler house, including drains.  Total.	Bureau of Yards and Docks...	600 by 218 by 50; 600 by 90 by 27.	\$0.05	\$472,800.00	1,140 by 218 by 50; 1,140 by 90 by 27.	\$0.05	\$760,000.00
	Inspector of ordnance...	3.....	24,000.00	72,000.00	4.....	24,000.00	96,000.00
	do.....	5.....	27,500.00	137,500.00	10.....	27,500.00	275,000.00
	Manufacturer.....	Two 14,000-ton.....	400,000.00	800,000.00	Three 14,000-ton.....	400,000.00	1,200,000.00
	do.....	One 200-ton, with 30-ton auxiliary.	50,000.00	50,000.00	One 200-ton, with 30-ton auxiliary.	50,000.00	50,000.00
	Inspector of ordnance...	Three 100-ton, with 25-ton auxiliary.	25,000.00	75,000.00	Four 100-ton, with 25-ton auxiliary.	25,000.00	100,000.00
	do.....	One 75-ton.....	21,500.00	21,500.00	One 75-ton.....	21,500.00	21,500.00
	do.....	.....	.....	45,000.00	.....	.....	45,000.00
	do.....	.....	.....	75,000.00	.....	.....	125,000.00
	do.....	.....	.....	4,000.00	.....	.....	6,000.00
	do.....	.....	.....	25,000.00	.....	.....	50,000.00
	Total.....	.....	.....	1,777,800.00	.....	.....	2,728,500.00
CEMENTING AND TEMPERING SHOP.  Building, structural steel, with galvanized-iron sides, including crane runways. Furnaces, regenerative, car-bottom, for cementation and treatment.  Cranes.  Spraying apparatus. Piping, water, steam, air, and drains. Water reservoirs.  Total.	Bureau of Yards and Docks...	600 by 218 by 50; 600 by 90 by 27.	.05	472,800.00	1,140 by 218 by 50; 1,140 by 90 by 27.	.05	760,000.00
	Inspector of ordnance...	18.....	27,500.00	495,000.00	35.....	27,500.00	962,500.00
	Manufacturer.....	{ One 200-ton, 30-ton auxiliary. Two 100-ton, 25-ton auxiliary.	50,000.00	50,000.00	One 200-ton, 30-ton auxiliary. Three 100-ton, 25-ton auxiliary.	50,000.00	50,000.00
	Inspector of ordnance...	One 16 by 40, double..	25,000.00	50,000.00	Two 16 by 40, double..	25,000.00	75,000.00
	do.....	.....	22,000.00	22,000.00	.....	22,000.00	44,000.00
	do.....	.....	10,000.00	10,000.00	.....	15,000.00	15,000.00
	do.....	Two 30 by 13 by 10, concrete.	3,000.00	6,000.00	Two 30 by 13 by 10, concrete.	3,000.00	6,000.00
	do.....	.....	.....	.....	.....	.....	.....
	do.....	.....	.....	.....	.....	.....	.....
	Total.....	.....	.....	1,105,800.00	.....	.....	1,912,500.00

Machine shop.

Item.	Source of estimate.	Unit price.	10,000-ton plant.		20,000-ton plant.	
			Number of units.	Total.	Number of units.	Total.
Building, with 2 spans 75 feet each—about 600 feet for 10,000-ton plant; about 800 feet for 20,000-ton plant.	Bureau of Yards and Docks...	1 \$0.08	600 by 150 by 50.	\$360,000.00	800 by 150 by 50.	\$480,000.00
Cranes:						
100-ton single-trolley traveling cranes, 25-ton auxiliary.....	Manufacturer.....	25,000.00	2	50,000.00	2	50,000.00
75-ton single-trolley traveling cranes, 10-ton auxiliary.....	do.....	21,500.00			2	43,000.00
75-ton double-trolley traveling cranes, each trolley 37½ tons.....	do.....	24,000.00	2	48,000.00	2	48,000.00
Machine tools and equipments:						
Edge planers, to plane edges of plates 32 feet long by 18 inches thick, any angle.....	do.....	24,000.00	2	48,000.00	3	72,000.00
Breast planers, to plane ends of plates 32 by 14 feet by 18 inches thick.....	do.....	26,000.00	3	78,000.00	5	130,000.00
Pit planer, to plane plates 20 by 35 feet by 18 inches.....	do.....	63,000.00	1	63,000.00	1	63,000.00
Standard planers, to plane 12 feet wide by 26 feet long.....	do.....	26,850.00	1	26,850.00	2	53,700.00
Standard planers, to plane 14 feet wide by 26 feet long.....	do.....	32,500.00	1	32,500.00	2	65,000.00
Standard 3 by 3 by 10 foot planer, 4 heads.....	do.....	4,000.00	1	4,000.00	1	4,000.00
Rotary planer and saw combined, 73-inch diameter head, 28 feet longitudinal travel.....	do.....	16,000.00	1	16,000.00	1	16,000.00
Rotary saws, 73-inch diameter saws, 28 feet travel (saw blades not included).	do.....	15,000.00	3	45,000.00	4	60,000.00
Universal drilling and milling machines, post 26 feet longitudinal and saddle 12 feet vertical travel.....	Inspector of ordnance.....	25,000.00	2	50,000.00	4	100,000.00
Portable Universal drilling and milling machines, post 24 inches horizontal, saddle 18 inches vertical, and spindle 26 inches horizontal travel.	do.....	1,875.00	2	3,750.00	3	5,625.00
2-post Universal drilling machines, with 16 feet between uprights and 8 inches clear in height.....	do.....	15,750.00	3	47,250.00	5	78,750.00
Radial drill, 6 feet vertical, 6 feet horizontal, and spindle 3 feet vertical travel.....	do.....	13,400.00	1	13,400.00	1	13,400.00
Grinding machines, 36-inch diameter wheel, 32 inches travel.....	Manufacturer.....	9,725.00	2	19,450.00	3	29,175.00
Tool grinders, Bridgeport No. 5.....	Inspector of ordnance.....	500.00	1	500.00	2	1,000.00
No. 1 Universal tool grinder, "Sellers".....	do.....	1,650.00	1	1,650.00	1	1,650.00
Armor-plate saw-grinding machine.....	Manufacturer.....	1,300.00	1	1,300.00	1	1,300.00
Tindell-Morris saw blades, for saw machines.....	Inspector of ordnance.....	860.00	6	5,160.00	12	10,320.00
3 by 36 inch New Model turret lathes.....	do.....	1,700.00	3	5,100.00	4	6,800.00
Special nut turret lathe.....	do.....	3,200.00	1	3,200.00	1	3,200.00
Little Giant (size E) air drills.....	do.....	82.00	7	574.00	10	820.00
Electric hand grinders, portable.....	do.....	300.00	4	1,200.00	6	1,800.00
Erecting pit, 12 by 12 by 36 feet deep.....	do.....	1 1.00	1	5,200.00	1	5,200.00
Erecting beds, 50 by 150 feet.....	do.....	13,200.00	2	26,400.00	2	26,400.00
Angle erecting stands.....	do.....	150.00	25	3,750.00	50	7,500.00
Lifting gear, sets.....	do.....	280.00	4	1,120.00	8	2,240.00

1 Per cubic foot.



Machine shop—Continued.

Item.	Source of estimate.	Unit price.	10,000-ton plant.		20,000-ton plant.	
			Number of units.	Total.	Number of units.	Total.
Machine tools and equipments—Continued.						
Test cutters.....	Inspector of Ordnance.....	\$4,500.00	2	\$9,000.00	2	\$9,000.00
Cast-steellifting dogs.....	do.....	160.00	20	3,200.00	30	4,800.00
Cutting tools for planers, saws, etc. <sup>1</sup> .....	do.....			30,000.00		41,400.00
Large mills with inserted blades.....	do.....			800.00		1,120.00
Small mills, miscellaneous <sup>2</sup> .....	do.....			4,000.00		5,874.00
Sockets, for mills, drills, etc. <sup>3</sup> .....	do.....			600.00		800.00
Boring bars for drilling and milling machines <sup>3</sup> .....	do.....			800.00		1,000.00
Flat, twist, and trepanning drills <sup>2</sup> .....	do.....			7,000.00		11,500.00
Taps for bolt holes, nuts, and miscellaneous <sup>4</sup> .....	do.....			15,000.00		20,500.00
Gauges, plug and ring, for bolts and nuts.....	do.....			800.00		1,100.00
Tap wrenches for miscellaneous taps.....	do.....			75.00		75.00
Ratchet wrenches for tapping, etc.....	do.....			125.00		125.00
Clamps, bolts, stops, etc., for setting up work and securing same on machines. <sup>3</sup> .....	do.....			4,000.00		5,250.00
Gauges, templates, etc., for inspecting plates.....	do.....			2,500.00		3,000.00
Miscellaneous sledges, hammers, pinch bars, surface gauges, straight-edges, measuring tapes, center punches, hose for air and water, etc.	do.....			800.00		1,190.00
Emery and corundum wheels for grinders, all types <sup>3</sup> .....	do.....			1,500.00		2,000.00
Tools for tool room:	Information received by committee.	1,200.00	1	1,200.00	1	1,200.00
16-inch tool-room lathe.....	do.....			2,665.00		5,330.00
30-inch tool-room lathe.....	do.....			2,450.00		2,450.00
Milling machine.....	do.....			500.00		500.00
Tool grinder.....	do.....			1,500.00		1,500.00
Universal grinding machine.....	do.....			700.00		1,400.00
Drill presses.....	do.....			125.00		125.00
Workbenches.....	do.....			800.00		800.00
Gauges.....	do.....			100.00		150.00
Vises.....	do.....			900.00		1,500.00
Miscellaneous small tools and equipment.....	do.....			600.00		800.00
Arbor presses, tool stands, tote boxes, etc.....	do.....			150,000.00		210,000.00
Installation of above tools, inclusive of foundations, wiring, etc.	do.....			5,000.00		7,000.00
Soda-water system.....	Washington Navy Yard.....			15,000.00		21,000.00
Heating.....	Bureau of Yards and Docks.....			2,500.00		2,500.00
Scale, 75-ton capacity.....		2,500.00				
Total.....				1,224,594.00		1,744,869.00

NOTE.—Replacement of tools per year: (¹) 100 per cent; (²) 50 per cent; (³) 25 per cent.

¹ Per cubic foot.

	10,000-ton plant.	20,000-ton plant.
Building.....	\$360,000.00	\$480,000.00
Cranes.....	98,000.00	141,000.00
Machine tools.....	582,554.00	867,614.00
Tools in tool room.....	11,540.00	15,755.00
Miscellaneous.....	172,500.00	240,500.00
Total.....	1,224,594.00	1,744,869.00

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